

A smart green future. Together.

Annual Report 2021



**This annual report presents operating results
for The New Zealand Institute for Plant and
Food Research Limited (Plant & Food Research)
for the financial year ending 30 June 2021.**

It meets our reporting requirements for
the Acts of Parliament under which we are
governed. Unless otherwise stated,
all figures are in New Zealand dollars (\$).

This report also demonstrates how we are
supporting our Core Purpose industries in
meeting their targets for economic and
environmental sustainability. It provides easy-
to-read information outlining our performance
and strategy against our Statement of
Corporate Intent 2020/21, as well as case
studies that demonstrate a cross-section of
our research and outreach activities. This
information is presented for the interest of our
key stakeholders, including shareholders, staff,
commercial partners, clients and research
collaborators.



Cover photo

We have a team of 1,000 people, including
Jim Walker and Anna Kokeny, undertaking
research and using new technologies to
create a smart green future for Aotearoa
New Zealand.



plantandfood.co.nz

More information can be found on our website
and our social media channels.

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Our Core Purpose

To enhance the value and productivity of New Zealand's horticultural, arable, seafood and food and beverage industries to contribute to economic growth and the environmental and social prosperity of New Zealand.

About us

At Plant & Food Research, we believe science can create a better future. By finding smarter, greener options today, we're helping secure the world we want to live in tomorrow. With our partners, we use world-leading science to improve the way they grow, fish, harvest and share food. Every day, we have 1,000 people working across Aotearoa New Zealand and the world to help deliver healthy food from the world's most sustainable systems.

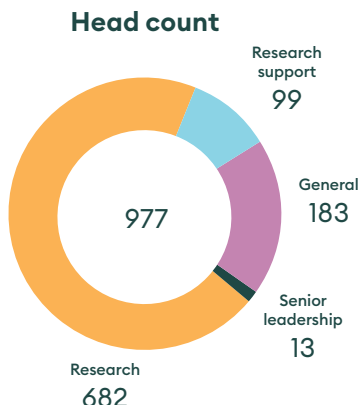
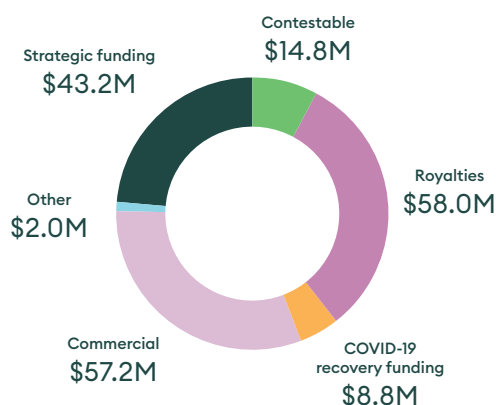
The Institute brings together more than 90 years of research supporting the primary industries.

- 1926** The Department of Scientific and Industrial Research (DSIR) formed
- 1928** DSIR joined with the Department of Agriculture in establishing a Plant Research Station
- 1936** Plant Research Station transferred entirely to the DSIR. The DSIR began doing its own research rather than coordinating those of other institutions
- 1980** The Fish Research Unit established at DSIR
- 1987** Ministry of Agriculture and Forestry (MAF) Technology division formed
- 1992** Ten Crown Research Institutes (CRIs) established out of former government departments, including DSIR and MAF Technology
- 2008** Plant & Food Research formed following the merger of former CRIs HortResearch and Crop & Food Research

Our Mission — to create the world's most sustainable food systems

Our activities are funded through direct commercial research for our customers, the reinvestment of royalties and the New Zealand Government's investment in science.

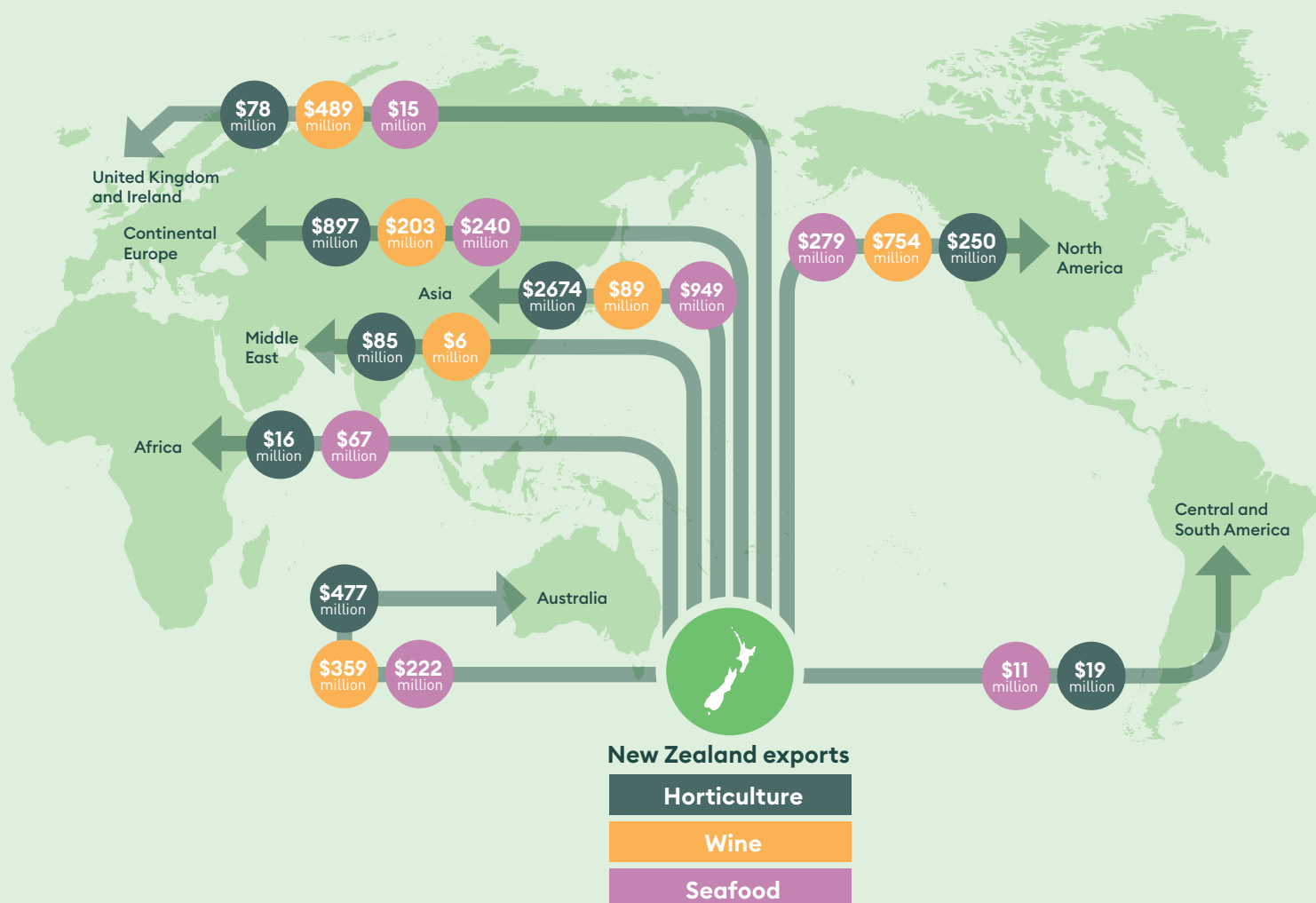
We have more than 900 staff based at 14 sites across New Zealand, as well as offices in Australia and the USA.



Strategic funding – Government investment allocated directly to each CRI
 Contestable – Government investment allocated through competitive bidding
 Royalties – Commercial return from plant varieties and IP
 Commercial – Direct investment by customers
 COVID-19 recovery funding – Government allocated COVID-19 funding
 Other – All other income sources

Our science plays a vital role in the success of our sectors

	Horticulture	Wine	Seafood	Food and beverage	Cropping
2020 Domestic market value (\$NZB)	2.8	0.6	0.4	21	1.6
2020 Export market value (\$NZB)	4.7	1.9	1.7	39	0.3



Horticulture and wine – year to 30 June 2020
 Seafood – year to 31 December 2020

Our locations



New Zealand



Australia



USA

Key

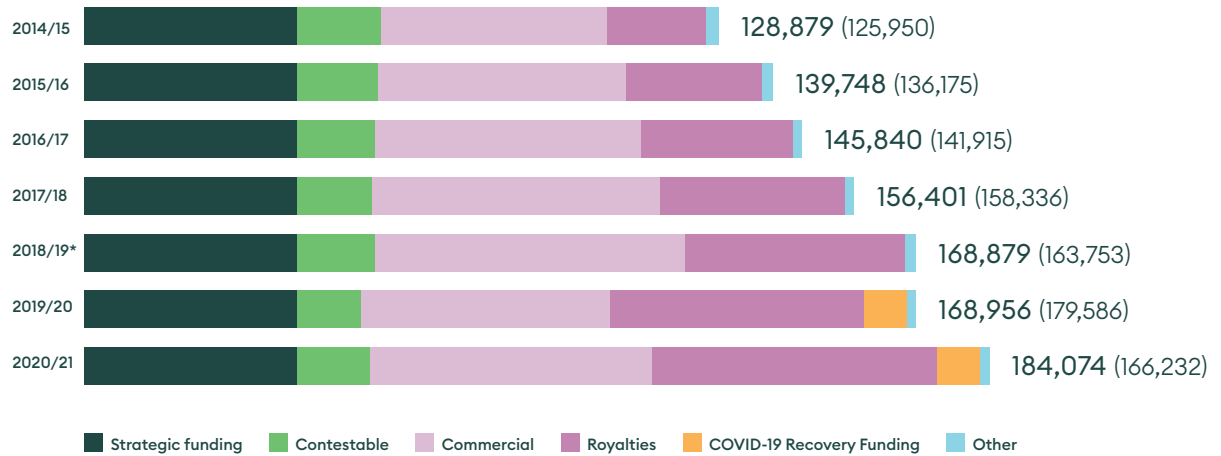


1/ Kerikeri				
SITE AREA (ha)	Total 52	Research farm 46		
RESEARCH PLANTINGS				
STAFF	Research 10	General 7	Total 17	

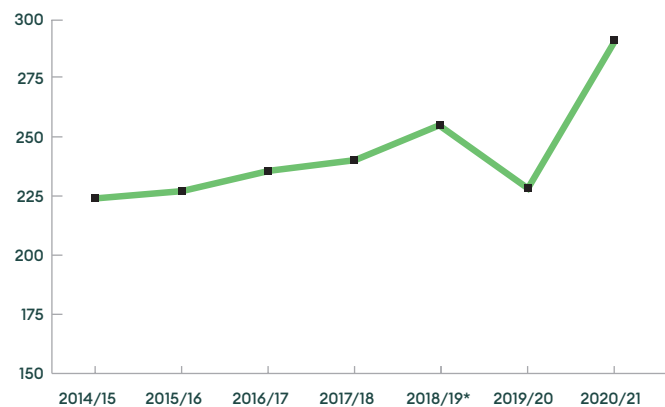
2/ Auckland				
SITE AREA (ha)	Total 7	Research farm -		
RESEARCH PLANTINGS				
STAFF	Research 177	General 147	Total 324	
3/ Pukekohe				
SITE AREA (ha)	Total 3	Research farm 2		
RESEARCH PLANTINGS				
STAFF	Research 2	General -	Total 2	
4/ Ruakura				
SITE AREA (ha)	Total 6	Research farm 1		
RESEARCH PLANTINGS				
STAFF	Research 63	General 9	Total 72	
5/ Te Puke				
SITE AREA (ha)	Total 46	Research farm 37		
RESEARCH PLANTINGS				
STAFF	Research 43	General 13	Total 56	
6/ Hawke's Bay				
SITE AREA (ha)	Total 48	Research farm 44		
RESEARCH PLANTINGS				
STAFF	Research 48	General 21	Total 69	
7/ Palmerston North				
SITE AREA (ha)	Total 9	Research farm 6		
RESEARCH PLANTINGS				
STAFF	Research 101	General 21	Total 122	
8/ Wellington				
Co-located at Science New Zealand				
STAFF	Research -	General 1	Total 1	
9/ Motueka				
SITE AREA (ha)	Total 55	Research farm 52		
RESEARCH PLANTINGS				
STAFF	Research 31	General 9	Total 40	
10/ Nelson				
SITE AREA (ha)	Total 1	Research farm -		
FINFISH FACILITY 590,600L				
STAFF	Research 40	General 11	Total 51	
11/ Blenheim				
Co-located at Marlborough Research Centre. Includes 10ha of research farm				
RESEARCH PLANTINGS				
STAFF	Research 11	General 1	Total 12	
12/ Lincoln				
SITE AREA (ha)	Total 186	Research farm 176		
RESEARCH PLANTINGS				
STAFF	Research 141	General 50	Total 191	
13/ Clyde				
SITE AREA (ha)	Total 58	Research farm 57		
RESEARCH PLANTINGS				
STAFF	Research 6	General 3	Total 9	
14/ Dunedin				
Co-located at University of Otago				
STAFF	Research 3	General -	Total 3	
15/ 16/ 17 Australia				
15. South Australia 16. Queensland 17. Victoria				
STAFF	Research 5	General 1	Total 6	
18/ USA				
18. Oregon				
STAFF	Research -	General 1	Total 1	

Our performance

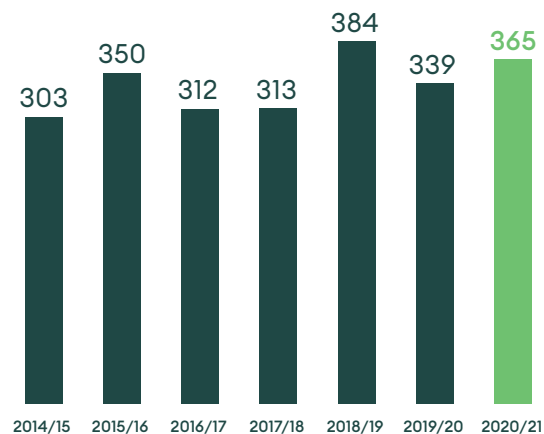
Revenue (\$000) Budgeted figure in brackets



Annual revenue / science FTE (\$000)



Peer-reviewed publications



* Revenue as reported in the 2018/19 financial year reflects the impact of adoption of New Zealand Equivalents to International Financial Reporting Standards 15 (NZ IFRS 15).

Highlights



Sequenced the genome of rewarewa

Signed an agreement to formally partner with NZ Hops Ltd to support the development of new varieties.

The new partnership will build a pipeline of new varieties of hops with new unique flavour and aroma profiles.

Created 'digital twins' of pollination processes in kiwifruit orchards from more than 30 years of field-based data from kiwifruit research with collaborators from the USA.

These mathematical models of the biology of the plants and behaviour of pollinating bees have been used to predict how growers can optimise their fruit set.

Partnered with T&G Global to develop new varieties of Rubus berries.

Through its VentureFruit business, T&G will co-invest in development and breeding of a range of new and unique berries with high consumer appeal.

Released the first new cultivar from the Hot Climate Programme (HCP). 'HOT84A1' is the first apple to be launched from the HCP, a collaboration between Plant & Food Research, Spanish partners IRTA and Fruit Futur, and strategic commercialisation partner T&G Global.

[For more go to page 44](#)

Worked as part of a team of Genomics Aotearoa scientists to sequence the genome of the native, rewarewa (*Knightia excelsa*), also known as New Zealand honeysuckle.

The milestone is significant as it is only one of a handful of New Zealand native trees to be sequenced, now paving the way for developing genomic processes for conservation of taonga species.

Awarded MBIE Endeavour funding for Cyber Physical Seafood Systems (Cyber-Marine) — a new multi-million dollar research programme aimed at achieving 100% utilisation and maximised value for all harvested wild and aquacultured seafood.

The programme will bring together world-leading scientists, technologists and engineers to create new responsive processing technologies, maximising value for New Zealand.

Received funding from MPI and industry to engage with vegetable growers around New Zealand, providing tools to help them apply effective nitrate management techniques suited to their land and operations. This work is part of the four-year Sustainable Vegetable Systems project, which aims to boost vegetable growers' ability to care for the health of the environment while supplying fresh, healthy foods.

Partnered with Sprout Agritech to spin-out Scention Bio technology. Designed for commercial use in medical, food or industrial settings, the technology is based on a ground-breaking discovery that a panel of synthesized insect receptors could be used to create a device to smell and taste chemical compounds.

[For more go to page 42](#)

Celebrated the opening of a new research facility in Riuwaka near Motueka. The new 1430 m² building combines with existing facilities to create more than 2800 m² of purpose-built laboratories and crop handling facilities, as well as offices and shared meeting spaces.

[For more go to page 55](#)

New research to maximise value from seafood resources



Partnered with University of Canterbury, Lincoln University, Manaaki Whenua Landcare Research, and AgResearch to launch a new postgraduate school to support the transition to more future-focused, sustainable food systems and preparation. The school will be a first for postgraduate research in New Zealand, and will focus on solution-based outputs intended to complement the range of existing food innovation initiatives.

In partnership with Hon. Damien O'Connor (Minister of Agriculture), United Fresh, New Zealand's pan produce industry organisation and Horticulture New Zealand, hosted the official launch of the International Year of Fruit and Vegetables (IYFV). The 74th Session of the United Nations General Assembly declared 2021 as the IYFV to highlight the nutritional benefits of fresh produce and recognise the significant contribution that fresh produce makes to the food security, generation of income, and employment of growers and farmers worldwide.

Worked with Helius Therapeutics to establish a New Zealand laboratory test to identify the presence of HLVd in medicinal cannabis plant material, based on overseas knowledge. Hop Latent Viroid (HLVd) has been found in established cannabis-growing regions worldwide and can cause significant loss of yield.

Business Manager Declan Graham and Pic Picot, founder of Picot Productions Ltd, inspect the peanut trial.



Looked at feasibility of growing peanuts commercially in Northland

Provided research expertise for a project looking at the feasibility of growing peanuts commercially in Northland. The \$91,320 project is led by Picot Productions Ltd, and MPI is contributing more than \$59,000 through its Sustainable Food & Fibre Futures fund. If successful, peanut farming could bring new employment opportunities to the Northland region.

Awarded funding by High-Value Nutrition National Science Challenge for a project with Torere Macadamias Limited (TML) in Gisborne that will identify and verify the uniqueness and nutritional value of New Zealand-grown macadamias. This knowledge will provide a sound basis upon which to develop and validate innovative high-value products for future local and export markets.

[For more go to page 31](#)

Created a photo-story exhibition that tells the story of four agricultural development projects we are delivering with partners in Viet Nam and Cambodia. 'From This Land' was on the core programme of the 2021 Auckland Festival of Photography.

Developed and launched a new website with external contractor Tribal Aotearoa. The website has been designed with maximum flexibility to support our science and business needs as they change.



Controlling disease
in our newest
plant-based sector

Celebrating our people



Photo: Farmers Weekly

ISHS Fellowship

Dr Susan Gardiner received the International Society for Horticultural Science (ISHS) Fellowship, and was elected a Fellow of the Royal Society Te Apārangi. These two prestigious honours recognise her outstanding contribution to global horticultural science, which enables New Zealand to be a world leader in international apple and kiwifruit breeding and genomics.

Dr Brent Clothier was appointed President of the Royal Society Te Apārangi, beginning his three year term on 1 July 2021. Brent is the first CRI researcher to be appointed to the position.

Dr Denis Curtin and Dr Mike Beare received the Leamy Award from the New Zealand Society of Soil Science for their research paper that provided the foundation needed to refine a new nitrogen mineralisation test, which is now being adopted by commercial testing laboratories in New Zealand.

Dr Nick Albert received the Royal Society Te Apārangi Early Career Research Excellence Award for Science (Hamilton Award) to celebrate his contributions to the future development of new fruit varieties with novel colours and enhanced nutrition, as well as when/how during evolution the earliest land plants acquired their 'sunscreen' properties to cope with environmental stress factors such as UV-B.



Dr Trish Fraser won the 2020 Women of Influence Award (Rural Category) in recognition of her three decades of dedication and contributions to the rural sector and rural community. The judges praised her collaborative approach and her rare skill of communicating science to farmers.

2020 Woman of Influence Award



Seafood New Zealand Longstanding Service Award



Alistair Jerrett (recently retired) received the Longstanding Service Award at Seafood New Zealand's Seafood Stars Awards for making a substantial positive difference to the seafood industry and for his leadership over his career.

The Future Orchard Planting Systems (FOPS) Team received a Primary Industry Award in recognition of their work creating a new growing system that increases the productivity potential of New Zealand's apple, pear and summerfruit orchards. The FOPS improves access, making orchard management simpler, which will enable future innovations in automation and robotic picking.

Sue Muggleston was announced a finalist for the MinterEllisonRuddWatts Commercialisation award for her work managing technology intellectual property since 2000, including ensuring commercialisation opportunities are realised, delivering partnerships that generate commercialised products and training others.

The Precision Seafood Harvesting Team received a Primary Industry Award for providing the science to underpin the commercialisation of a sustainable fishing system. The system offers an alternative to traditional trawl nets and enables fish to swim throughout the capture process so that they are landed in the best possible condition on the fishing vessel.

Dr Maren Wellenreuther received the 2020 Thermo Fisher Scientific™ Award for Excellence for her high calibre of molecular biology research. Her work focuses on aquatic species, particularly native taonga species, and is notable for its blend of fundamental and applied research questions.

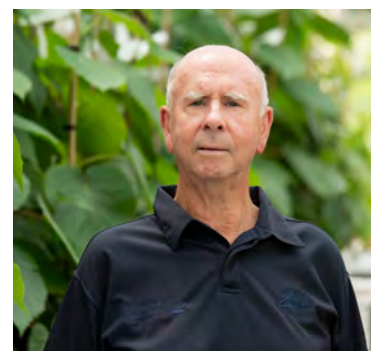
Our mentoring programme won the award for Learning and Development Capability at The Human Resources Institute of New Zealand (HRNZ) national awards. The initiative provides a formal system to create more value and impact from mentoring relationships among staff.



Internal awards

Science New Zealand National Awards

The Kiwifruit Genome Sequencing Team won the Plant & Food Research Team Award for their work manually annotating the kiwifruit genome, which will greatly benefit future breeding efforts by improving the power of genetic analysis and genomics-assisted breeding.



Dr Russell Lowe was recognised with a Lifetime Achievement Award for his breeding and selection of new cultivars, now marketed as Zespri™ Gold Kiwifruit, Zespri™ SunGold™ Kiwifruit and Zespri™ Red Kiwifruit, which have transformed the industry.

Dr Lisa Evans received the Plant & Food Research Early Career Research Award for her research that provides insights into how the movement patterns and cognitive ability of honey bees, bumble bees and other insects affect their efficacy as crop pollinators.

HRNZ Learning and Development Capability Award

Our scientists, including Charles Dwamena, are finding new ways to improve the sustainability of commercial crops.





Our Strategy



Building resilience

Report from the Chair



Aotearoa New Zealand's food sector is vital in supporting our nation as we navigate the effects of the global COVID-19 pandemic.

Whilst COVID-19 has challenged our sectors, such as by reducing access to seasonal workers and limiting transportation services, they have continued to feed not only our own people but 40 million worldwide. As an island nation far from others, in times of significant threat to our health and wellbeing, this ability to feed all New Zealanders is as important as maintaining our economic stability through exports.

Science has a greater role than ever in addressing the needs of not just our nation, but those of the world. The world is facing complex challenges that science is well placed to address. Climate change, food security, and loss of biodiversity are issues to which Aotearoa New Zealand, and Plant & Food Research itself, can contribute unique knowledge. We, like many other nations across the world, are increasingly focused on how we can support the UN's Sustainable Development Goals (SDGs), both at home and abroad.

Plant & Food Research is beginning to better understand its own place in building a more sustainable world, and has embarked on a number of exercises to identify and improve how the organisation performs against the SDGs. As Chair, I'm proud to see this Annual Report begin to share this process through Integrated Reporting (see page 18), sharing what is being achieved not only in terms of profit, but also for people and planet.



Building resilience in our own organisation

Throughout this past year, I have been inspired once again by the resilience of Plant & Food Research and its staff.

The last year has not been easy, but the Plant & Food Research team has risen to the challenge and continued to deliver in difficult circumstances. I regularly learn of new ways the organisation is contributing to the agrifood sector and its ongoing sustainability, and this continues despite the ever-changing nature of the COVID-19 pandemic.

Resilience has been our aim over the past year – throughout the pandemic, the Board and the Senior Leadership Team have prioritised protecting jobs and building financial reserves. This has held us in good stead, and I am confident that the organisation is well placed to weather any unknowns in the future.

Our financial result for the 2020/21 year is a testament to this strategy, balancing the losses made in the previous financial year. The decision to keep capital costs low during the uncertainty of the 2020 calendar year means Plant & Food Research now has the ability to remain flexible through any future uncertainty and continue with important investments in buildings and facilities.

On behalf of the Board, I wish to thank the Senior Leadership Team and the staff of Plant & Food Research for continuing their great work in building a strong, resilient organisation that is well placed to help Aotearoa New Zealand and the world move into the future.

Nicola Shadbolt
CHAIR

Three red apples are positioned around the central text. One apple is in the top left, another in the bottom left, and a third in the bottom right. The background is a solid, warm orange color. The text is centered and reads "Uncertainty brings opportunity".

Uncertainty
brings
opportunity

CEO's review



We are now 18 months into the COVID-19 pandemic and whilst there has been hardship for some, we in Aotearoa New Zealand have been fairly well protected from the immediate impacts of the disease.

Whilst some sectors have struggled, the agrifood industry as a whole has continued to offer the world high-quality, healthy, safe foods and has therefore remained a favourite with global consumers.

The uncertainty of the pandemic has provided an unforeseen opportunity for us to become more connected – to our partners and to the New Zealand science sector. In a time where it has been necessary to work together to ensure maximum benefit to Aotearoa New Zealand during major disruption, we have begun having conversations that may not have otherwise occurred.

We have had candid conversations with partners and customers about what they need from us and our science, both in the near term and into the future. This has created new collaborations, partnerships and science programmes that will support our industries in meeting their growth targets. We are proud to be the science underpinning many of their decisions on how to meet local and global challenges.

We have also pulled together as a science sector to focus on the concerns we have as a nation. We have used this time to understand how we can work together to have an impact on big picture issues such as climate change, water quality, land use and biodiversity. We are in conversation with the Government as to how this might look going into the future.

For Plant & Food Research, our decision to be cautious in our approach to investment over the 2020 calendar year has left us in a comfortable financial position that will allow us to accelerate our plans over the next financial year and get back on track. Our investment into facilities, buildings and people is vital in keeping Plant & Food Research moving forward and remaining an attractive place to work at and to partner with.



Our strategy sets us up well to deliver on our brand promise – a Smart Green Future, Together. We have now fully transitioned our future-focused science into the Ngā Pou Rangahau Growing Futures™ Directions, creating the science we believe will best deliver for Aotearoa New Zealand and our sectors in the future. Our financial resilience has also provided us with the opportunity to challenge ourselves to try new ideas, such as spinning out our technologies into new companies like Scentian Bio (see page 42) and investing more in our own technology development to keep our science heading towards delivering impact.

A farewell, a welcome and thanks

I would like this opportunity to farewell Philippa Stevens, our inaugural Group General Manager Science Services, who left Plant & Food Research at the beginning of 2021. Philippa has been an enormous contributor to the establishment of our Smart Green Future strategy and I wish her well on her next endeavours. I also wish to welcome Jolon Dyer who joined us in June as our new GGM Science Services, and is quickly learning the ropes. I also wish to thank Richard Newcomb for taking on the leadership of Science Services between these two appointments, no small task in addition to his role as Chief Scientist.

I must also offer my sincere gratitude to every staff member at Plant & Food Research. It's been a tough year and you've held up admirably in the wake of the pandemic and all the necessary changes we've had to make to keep performing. I am in constant awe of the resilience of the Plant & Food Research team and how everyone supports each other, and I know that you will continue to make our Institute a great place to work as we enter a 'new normal'.

David Hughes
CEO

Our Strategy

We believe our science can make the world a better place. That by working together, we can create a smart green future for Aotearoa New Zealand and the world.

We invest in our people, our facilities, our information systems and in future science. We believe that these are vital parts of creating an organisation that delivers world-class science.

We know our science can only make a difference if it is applied outside the lab. We build relationships with customers and partners, including with Māori organisations, to find the best ways for our science to help their businesses grow.

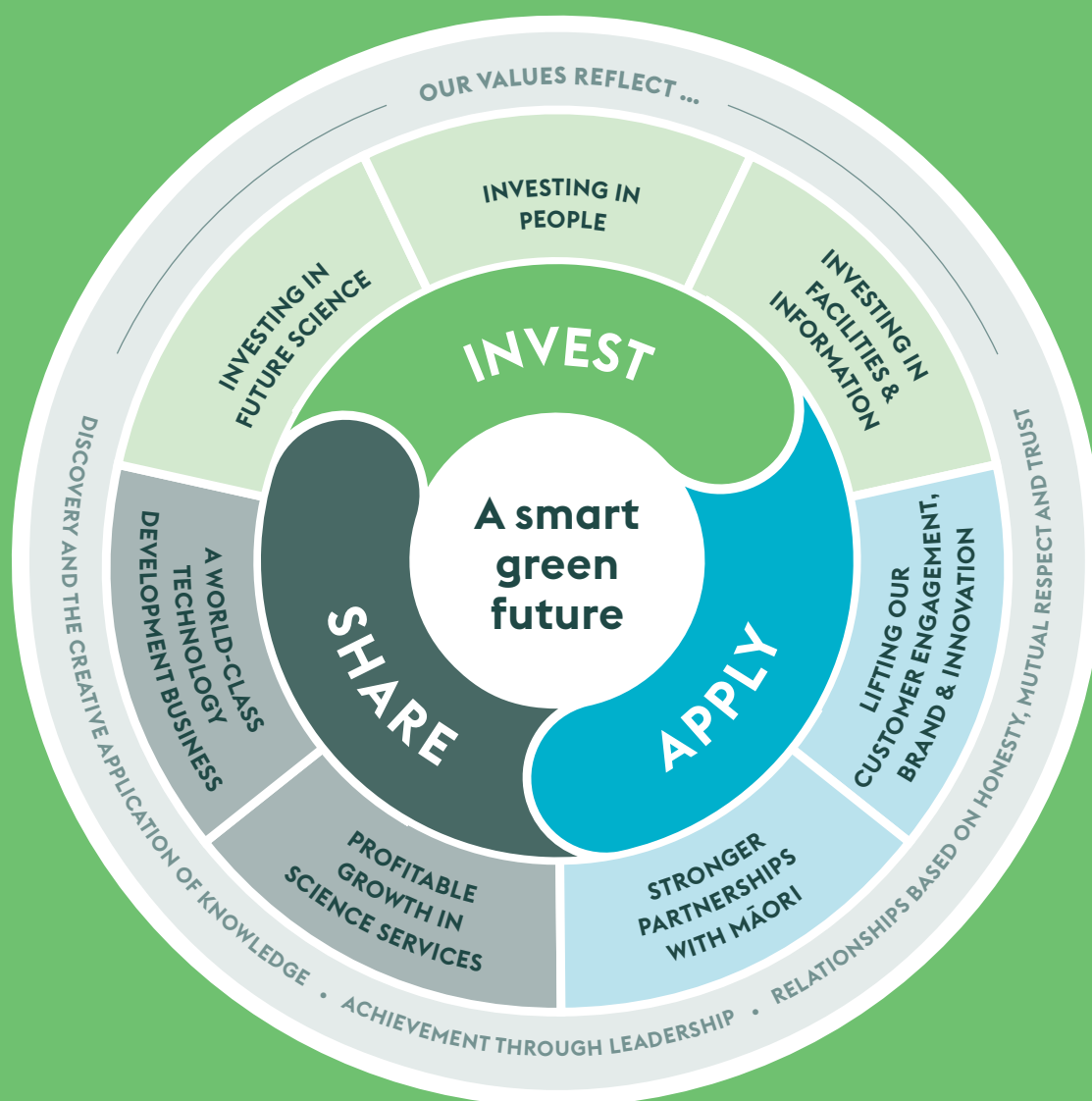
We then share our knowledge and skills, so that our customers, our partners and Plant & Food Research itself receive fair value from the results of our science. We provide R&D services for those that need it and create pipelines of new technologies for commercialisation, either directly by us or in partnership with others.

For us, a smart green future means we use all available knowledge to produce healthy, nutritious food from the land and sea, while ensuring we protect our environment and create opportunities for future generations.

Our strategy has three elements that together will deliver a smart green future for Aotearoa New Zealand:

1. Invest / Whakangao
to create world-class science
2. Apply / Whakamahi
that science to create maximum value
3. Share / Tuari
that value fairly with those who have contributed to its creation to increase the sustainability of their businesses.

This strategy is realised through seven strands that ensure our activities align with the requirements of our Institute, our customers and our partners.



Our sustainability agenda

The main goal of Plant & Food Research is the development of the world's most sustainable food systems. Sustainability is at the heart of everything we do, and we are committed to not only helping our customers, partners and the wider food sector improve the sustainability of their businesses, but also to leading by example and making sure we are working in the most sustainable ways in our own organisation.

We want to know our work is beneficial to people and planet, and has purpose, as well as delivering profit, primarily for our customers but also to allow us to invest in our own organisation – the multiple bottom line of a sustainable business.

Our sustainability agenda has three strands:

Thought leadership – sharing with others our knowledge and insights of ways to be a sustainable business to create new conversations about the future of food

Innovation leadership – making sure our customers and partners understand how our science can help their businesses be more sustainable

Authentic leadership – making sure Plant & Food Research includes sustainability in its own business decisions.

Advancing our sustainability agenda

Creating a smart green future requires that our work benefits people and the planet, and that we lead by example.

Plant & Food Research also must demonstrate that we are a sustainable business and do this transparently so that our performance can be fairly assessed against our goals. While being sustainable requires that we consider our effects on the planet and take stock of our footprint, it also involves us in leading thinking around sustainable food systems in New Zealand and providing innovative science to address today's challenges and create future options.

Our commitment to sustainability doesn't just make good business sense through reduced impacts and costs and being a more "future fit" organisation. It's also important to the people who work at Plant & Food Research, and to those who will join our teams in the years ahead.

This year, our Statement of Corporate Intent identified six key inputs or capitals:



NATURAL
Our impact on the planet



SOCIAL AND RELATIONSHIP
Our networks and collaborations



HUMAN
Our people



INTELLECTUAL
Our products and services



FINANCIAL
Our financial resources



MANUFACTURED
Our infrastructure

We have aligned our seven strategic strands with these capitals and identified Key Performance Indicators that will enable us to evaluate our impacts on them.

We will measure our progress using the Future-Fit Business Benchmark and report on our progress using Integrated Reporting (IR).



Becoming a Future-Fit Business

We have adopted the Future-Fit Business Benchmark, a self-assessment tool to help us manage and improve our operational sustainability. This tool is also helping us to track our impacts against specific UN Sustainable Development Goals and the six capitals we are using to integrate our reporting.

The benchmark includes 23 science-based ‘break-even’ (or cause-no-harm) goals. These represent the minimum standards we must meet when using energy and other resources as well as the way we support the wellbeing of employees and surrounding communities. These goals also help us consider the impacts our products have on people and the planet.

Benchmarking for our baseline year of 2018/19 is almost complete and has provided some valuable insights including:

- All energy from renewable sources. We were 65% Future-Fit overall across our 14 sites. Individual sites ranged from 39%, where natural gas consumption is a significant proportion of our total energy consumption, through to 100% Future-Fit where we consume only renewably generated electricity. A more detailed energy audit is planned to identify where we can most swiftly improve our performance against this goal.
- Procurement is an important, but challenging, Future-Fit goal for Plant & Food Research given the wide variety of products we consume and suppliers with which we deal. We expect to complete an initial assessment of our performance against this goal by late 2021.
- Products do not harm people or the environment. Our 100% fitness score for this goal reflects the nature of our core business: creating new knowledge and insights rather than physical products.

The Future-Fit Business Benchmark also includes 24 ‘positive pursuits’ that enable assessment of an

organisation’s activities that go beyond break-even and positively contribute to a future-fit society. We expect to commence assessment of our performance against these goals in early 2022.

Adopting Integrated Reporting

Committing to sustainability requires a new type of reporting beyond relying on financial results as indicators of the value we create. Our reporting must show how we’re creating impact over the short, the medium and the long term.

In this way, we can show how our sustainability agenda will create value; how we will meet sustainability criteria; how we will contribute to a smarter and greener future; and how we can meet growing expectations of corporate social responsibility.

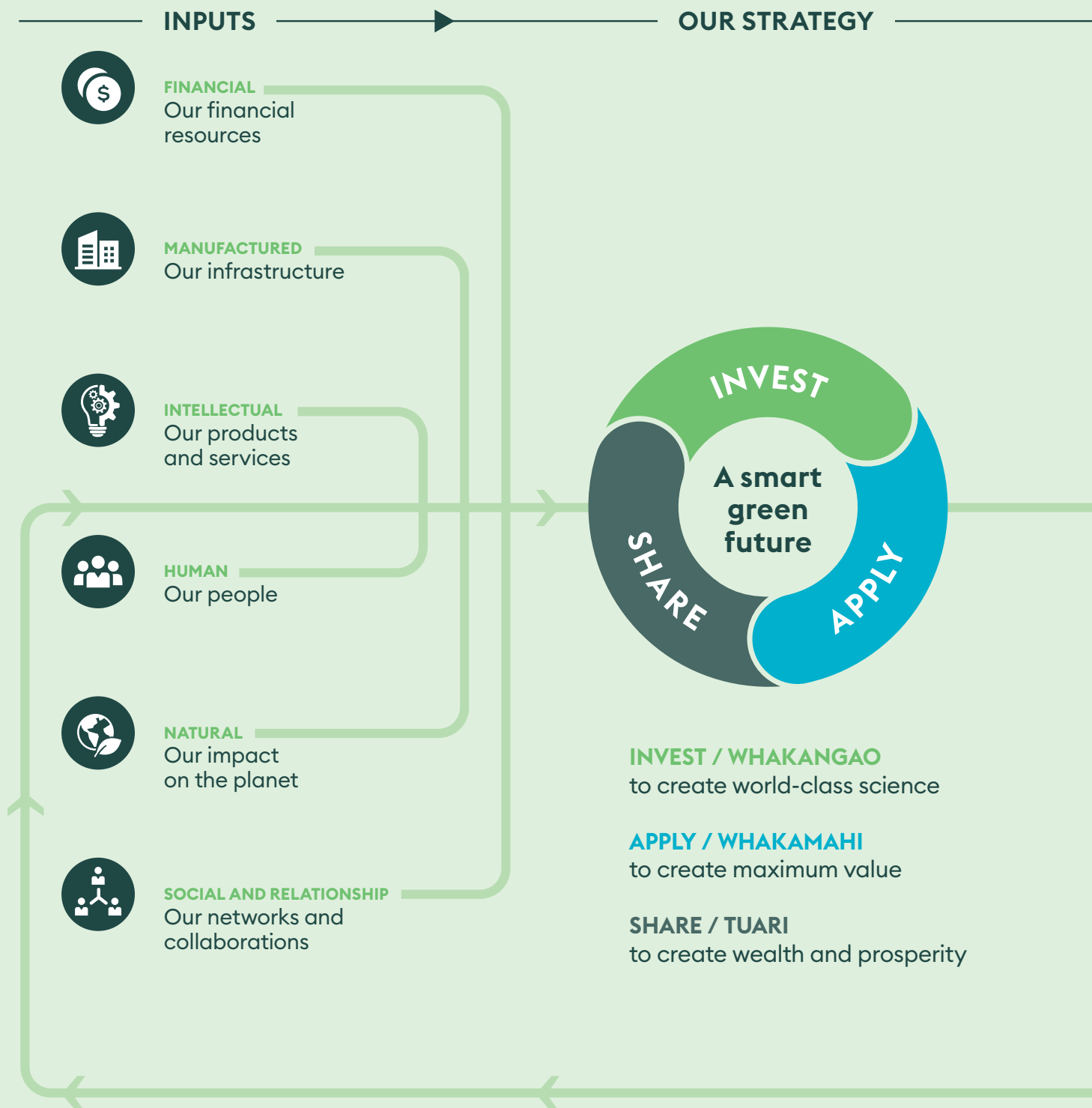
This is why we are moving to Integrated Reporting, or IR. It will enable us to show how our sustainability agenda will help us create value over time – in other words, a smart green future. Today, we report about our inputs, activities and outcomes; under IR, we will report the impacts of our activities against the six capitals.

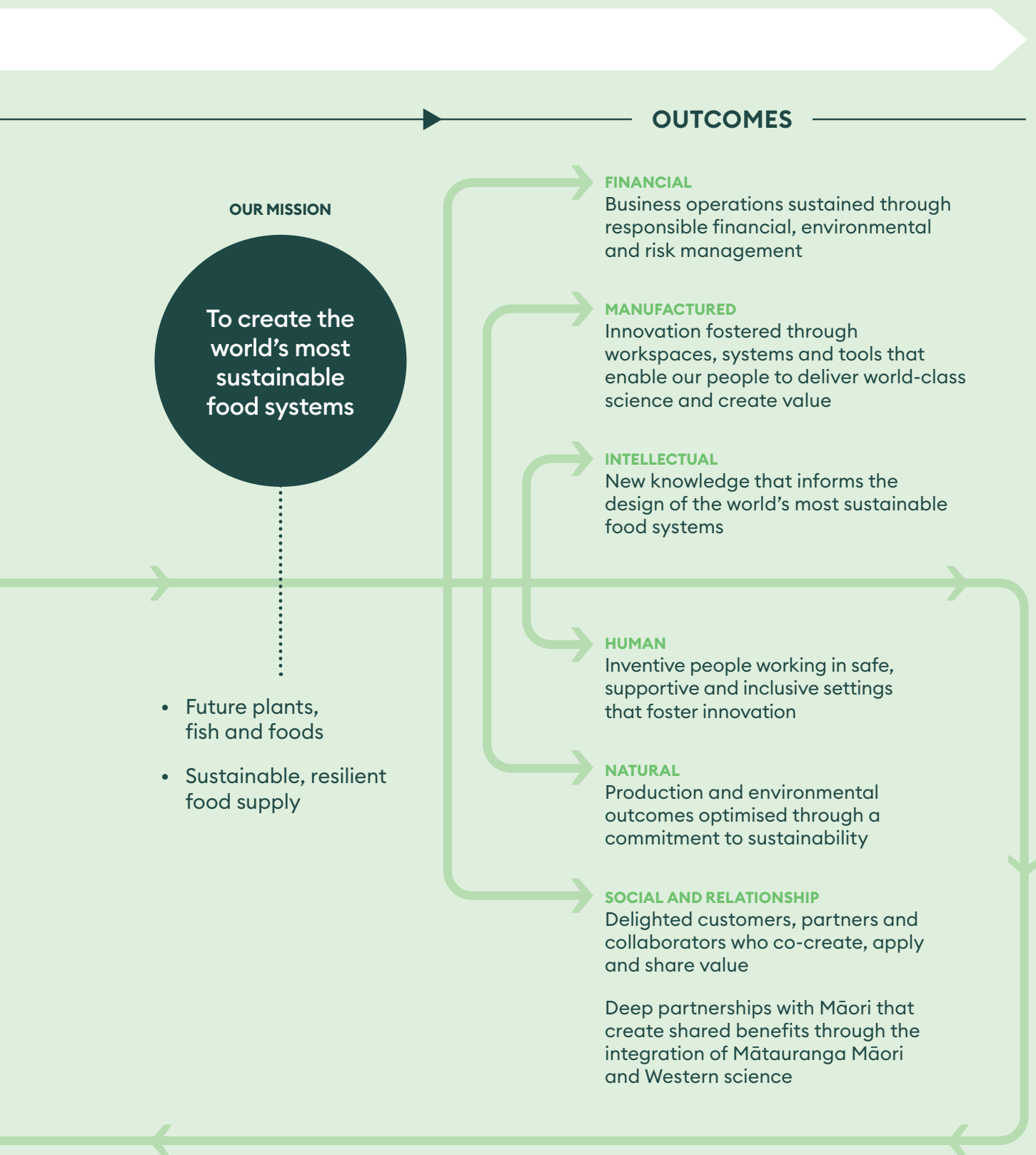
Future annual reports will show how Plant & Food Research creates value using our strategy, governance, performance and prospects within the commercial, social, cultural and environmental contexts in which we operate.

Internally, IR can benefit our management and governing structures by joining up conversations to evaluate options and identify clear organisational goals. It will push us to bridge business units and functions, time horizons, and internal and external perspectives when setting targets and reviewing progress. It will help us evolve our business model and strategy, based on the results of our efforts to deliver on our goals. It will reduce organisational silos by improving our understanding of cause and effect, and ensure we focus on the important decisions required to contribute to a smart green future.

How we define and create value

Value creation over time





Our researchers, like Ron Beatson, work with customers, such as Kim McGlashen at Mac Hops, to ensure our science is appropriate in the commercial environment.





Apply /
Whakamahi

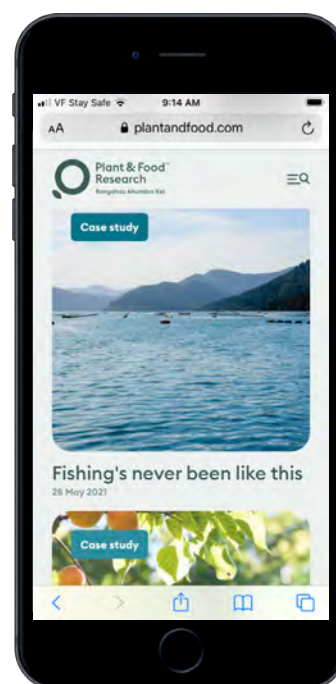


Through the Cambodia Quality Horticulture project, our scientists have helped improve the safety and maximise quality and productivity of vegetables by establishing standardised good practice.

Lifting our customer engagement, brand & innovation

Our customers are part of our community. We work alongside them, often over many years, to create research plans and deliver the science that helps their businesses grow. We work with these customers in a number of different ways. They may fully fund research themselves, but we may also work together to find investment from other organisations, or use our own money as co-investment in a project. What's important is that our customers know we're behind them and will find a way to help their business succeed.

We value our relationships with our customers, with investment agencies, and with our science collaborators. We share stories of these relationships, to show how our science and our staff are helping to create a smart green future.



Our new website shares stories of our science, our scientists, and how we're creating a smart green future together with our partners and customers.



HUMAN

International Development

Our International Development Unit (IDU) enables Plant & Food Research to provide a tailored approach to our work in developing countries – building our reputation in partnering to develop and implement projects across the value chain that deliver sustainable impact, reduce poverty and improve lives.

Our current portfolio of projects focuses on the horticultural and seafood sectors, with projects in the Pacific, Asia, Africa and the Caribbean. These projects contribute to and support the priorities of the New Zealand Government and the United Nations' Sustainable Development Goals (SDGs); expand the experience-base and worldliness of our scientific capability; create opportunities for New Zealand industry in rapidly developing economies; and expand our brand profile in new markets.

High quality horticulture in Cambodia

The Ministry of Foreign Affairs & Trade (MFAT)'s New Zealand Aid Programme-funded Cambodia Quality Horticulture project is a private sector-led initiative, looking to grow income and opportunities throughout the Cambodian horticultural value chain. The programme has a strong focus on training farmers and postharvest operators on best practices aligned with GAP (Good Agriculture Practice) and/or preferred supplier programmes. Human-centred design is also being used to develop new agronomic and postharvest solutions, including the development of a new washing table to deliver clean product to consumers. We are also working closely with the Cambodian Government on the implementation of GAP systems.

2017–2022

Myanmar resilient horticulture

The Myanmar Resilient Horticulture (MRH) project aims to increase the incomes and food security of rural farmers in Myanmar. Plant & Food Research and its in-country partner, Proximity Designs, have selected onion, tomato, potato, cabbage, and chillies as target crops, providing further diversification and income generation to farmers who traditionally grow paddy and pulses. This five-year project funded by the New Zealand Aid programme begins with a research and design phase to understand constraints, to co-design and to test new services and products with smallholder farmers. Following this, the MRH project will strengthen farmer advisory services to provide tailored information to smallholder farmers and introduce new irrigation products that are climate-smart and designed to meet smallholder needs. The MRH project also works to strengthen linkages between rural producers and domestic markets with a focus on reducing post-harvest losses and improving the quality and safety of horticultural products.

2019–2025

Sargassum seaweed in the Caribbean

A new initiative in the Caribbean funded by the New Zealand Aid Programme is focused on the problem of *Sargassum* seaweed inundations and their impact on tourism, fisheries, human health and the environment (for example, beach erosion). In partnership with the Caribbean Regional Fisheries Mechanism (CRFM) we are looking at product development options for this seaweed.

2020–2023



Taking dragon fruit to the next level



We are helping Viet Nam diversify its dragon fruit industry, with a particular focus on high-value markets, the introduction of new varieties and commercialisation.

In 2013, Plant & Food Research began the New Premium Fruit Variety Development Project (NPFVD) between partners in Viet Nam and New Zealand agriculture and agribusiness experts. The initiative was funded by the New Zealand Aid Programme with co-investment from the partner institutions. Viet Nam is the world's largest producer and exporter of dragon fruit, supplying about 50% of the global market.

Our commitment to Viet Nam's dragon fruit market extends right across the value chain from production through to marketing.

While red is seen as a lucky colour in Asia, suggesting our red-fleshed variety would do well, we have also developed varieties with white or pink flesh.

With our input, Viet Nam is developing novel cultivars, sustainable production techniques, and postharvest systems, and we've conquered canker disease. Farmers are growing fruit that will meet the needs of premium markets where consumers are prepared to pay top prices. We've introduced Viet Nam to the protection of plant variety intellectual property in fruit crops – something that is new to their country. Cultivation improvements have averted crop and income losses for farmers for both local and traditional export markets, with immediate benefit.

Expanding the Viet Nam dragon fruit sector

Plant & Food Research, the Southern Horticultural Research Institute (SOFRI) and the Sub-Institute of Agricultural Engineering and Post-Harvest Technology (SIAEP) have been collaborating on a New Zealand Aid Programme to enhance the Vietnamese dragon fruit industry. The project has developed a range of novel dragon fruit varieties with new flavour and colour combinations, a new production system to enhance productivity, a protocol for the control of canker (a significant disease threatening the industry), and improved postharvest high pressure washing and cool-chain management systems. The emphasis in the past year has been setting up sustainable extension pathways that will continue beyond the life of the project and commercialisation of new varieties.

2013–2021

Vanilla sector development in Tonga

In June 2019, we commenced a new initiative funded by the New Zealand Aid Programme to develop the Tongan vanilla sector. The programme is designed to grow the sector through better agronomic practices and management, to improve vanilla yield and quality.

2019–2024

Avocados in central highlands of Viet Nam

We are partnering with New Zealand G2G and Sam Agritech to deliver technical know-how on avocado production, handling and processing. Critical to the success of this public-private partnership will be the benefits accruing to smallholder producers in the Dak Nong region and the establishment of new research partnerships with Vietnamese collaborators.

2018–2021

Developing horticulture in northern India

A partnership between New Zealand and the State of Himachal Pradesh, northern India, is working to improve production of the region's key fruit crops, with a particular focus on apples. Funded by the World Bank, the Himachal Pradesh Horticultural Development project involves a range of scientists from New Zealand organisations, including Plant & Food Research, with support from the New Zealand apple and pear industry and government agencies.

2018–2021

Avocado farming in Kenya

We're working alongside New Zealand industry partner Olivado and the New Zealand Aid Programme to support sustainable economic development of small-holder avocado orchards in Kenya. In late 2019, we entered the extension phase of this programme, which looks to facilitate wider adoption and extend the results beyond the Olivado supply chain.

2013–2022

Improved sustainability for Vietnamese vegetable farming

A five-year development project in Binh Dinh Province funded through the New Zealand Aid Programme has been drawing on our expertise in sustainable horticulture to improve the environmental and economic sustainability of vegetable farms, and safety outcomes for both farmers and consumers. The launch and implementation of the La Lanh Viet-GAP certified vegetable brand has been a key development during the final stages of the project.

2016–2021

\$2.9M (\$3.5M)
Revenue from new customers

BRACKETS INDICATE TARGET

A taste for better immune support



The global functional food market was valued at US\$173.26 billion in 2019 and is expected to reach US\$309 billion by 2027. There is a strong demand for functional food products to support healthy immune function and combat the adverse impact of air pollution.

BerriQi® is poised to capture a segment of this rapidly growing global market, with a strong focus on Asia. Drivers for growth include increasing prevalence of chronic diseases, an aging population, and the health impacts of severe air pollution.

BerriQi arose from a partnership between Plant & Food Research and Anagenix, which supplies ingredients for functional food, supplement and nutraceutical producers. Plant & Food Research has shown that the BerriQi Boysenberry and apple juice supplement may offset the effects of severe air pollution.

After promising pre-clinical findings, we have been granted funding from the High-Value Nutrition National Science Challenge for a human clinical trial. Deteriorating air quality in China, coupled with consumer research, suggests there is strong demand for functional food products designed to combat the adverse impact of air pollution, especially when backed by solid scientific evidence.

We're now working on a powder version of BerriQi which is cheaper to ship, offers the consumer control over dilution, could be put into capsules, and could be sprinkled on food.



A man with short brown hair, wearing a dark blue shirt with a white dot pattern, is looking down at a small pink flower he is holding with both hands. He is standing in a greenhouse or nursery, surrounded by various potted plants. In the background, there are more plants in green pots and some structural elements of the building. The lighting is bright and natural.

Our scientists, such as David Chagné, are working with Māori to understand taonga species like mānuka.

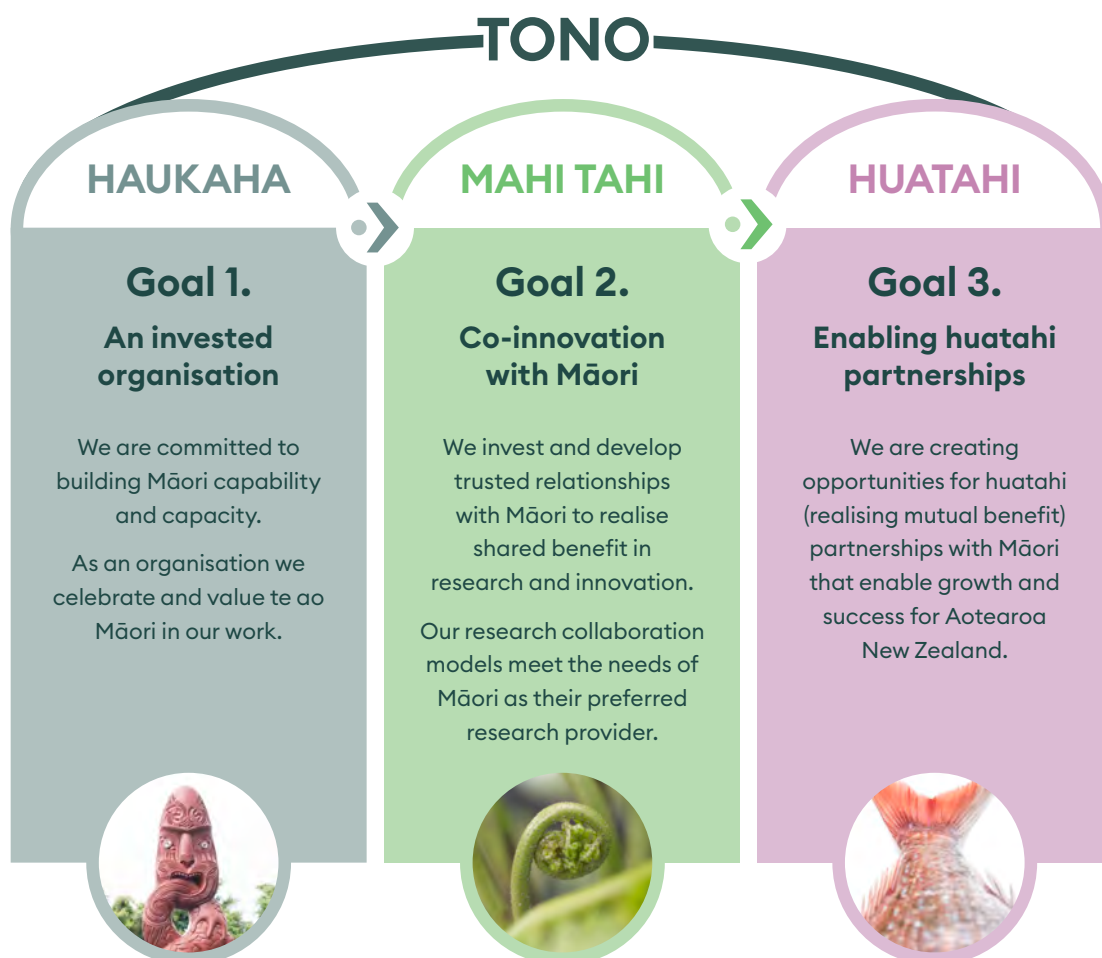
Stronger partnerships with Māori

Māori, like many indigenous people, have knowledge systems that span thousands of years and oral traditions describing connection to the natural world. Mātauranga Māori (knowledge) and Māori taonga (treasures) are inherited and entrusted to the current generation to care for, to contribute to, and to evolve for future generations.

Plant & Food Research recognises the importance of Māori concepts such as taiao – the interconnection between all living things – and huatahi – mutually reciprocal relations and benefit sharing – and we are weaving these into our everyday mahi (work). These concepts support us in developing the best food systems in the world.

Many Māori organisations are guided by inherent responsibilities to deliver benefits to their people that go beyond immediate financial gain. We work together with our Māori partners, moving towards collaborative research models that weave together science and Mātauranga Māori. We are creating long-term relationships with Māori organisations that promote shared benefits and guide our research when working with taonga tuku iho (treasures to hand down to future generations). Working together with Māori we can create, innovate and preserve taonga – including our lands (whenua), oceans (moana) and plant and food species – for future generations.

We want to be a part of this value chain as a preferred collaborator to Māori organisations, conducting research that contributes to the long-term cultural, social and environmental wellbeing of Aotearoa New Zealand.



Tono (to seek agreement) is the first phase of our strategy to build stronger relationships with Māori.



We're looking at whether pātangaroa, the 11-armed seastar, has unique bioactives that could be used in products to aid human wound healing and skin health.



INTELLECTUAL

Pātangaroa — a problem with potential?

Pātangaroa, 11-armed sea-stars, are voracious predators of shellfish, causing a dramatic decline in populations of mussels, pipi and cockles, whilst also damaging the coastal environment and its diversity.

One of the most affected areas is Ōhiwa Harbour in the Bay of Plenty, where estimates suggest there are at least 672 tonnes, or 1.2 million, of pātangaroa in the harbour, making their removal and control very expensive.

Local iwi, with support from the Bay of Plenty Regional Council and the Ōhiwa Harbour Implementation Forum, are looking at innovative ways to manage pātangaroa, and this is where it becomes interesting. Pātangaroa might have economic potential because they could contain a rich source of unique bioactive compounds that could help human wound healing and skin health. Specifically, they could also be a novel source of marine collagen which is in high demand for cosmetics and supplements.

We've joined forces with the Cawthron Institute and the University of Waikato to research their possible bioactives and the development of concept products. We're also working closely with iwi to develop a clear intellectual property strategy and future economic feasibility. Financial returns could fund ecosystem-management for the harbour and surrounding coastline aligning with local Māori values.



HUMAN

Putting rangitahi at the centre

Our summer student programme hit a new milestone in 2020, with 18 of the 36 students identifying as Māori.

Te Rito is a career pathways pilot, developed in line with our Tono strategy to build our Māori cultural capability, invest in Māori talent, celebrate te ao Māori and strengthen our commitment to Te Tiriti o Waitangi.

We want to create a meaningful student experience where rangatahi Māori thrive in science and research and have pathways to high-value careers.

We pair students with Māori mentors using the tuakana/ tēina mentoring model. This model has the potential to enhance students' academic achievements while also upskilling them through engagement opportunities with networks (Māori and industry), leadership training, career planning and coaching.

Their project topics included understanding the impact on COVID-19 on horticulture, Mātauranga Māori, food and seafood industries; digital twinning; taonga species; the Māori economy; biosecurity; molecular and digital breeding; and site engineering.



SOCIAL AND RELATIONSHIP

Developing local skills to regenerate local ecosystems

The Ūawanui community in Tolaga Bay wants to stop further degradation of local ecosystems caused by intensive forestry and agriculture, and re-establish their rohe's natural flora.

Te Aitanga-a-Hauti Centre of Excellence and Plant & Food Research joined forces to develop local skills with the goal of establishing the Ūawanui Cultural Nursery to preserve locally sourced native plant species – 'regional treasures' – for Te Aitanga-a-Hauti iwi.

Now halfway through, Ūawanui Eco-Cadets and their Kaiaitaki Ako have connected with experts in nursery management and plant propagation and conservation. The Eco-Cadets are gaining life skills in nursery design, riparian fencing, weed and pest control as well as studying for their drivers' licences, budgeting, and interacting with local government and the forestry sector.

The next stage of the project will focus on accessing specialist knowledge for germplasm conservation and developing a framework for conservation of Ūawa rohe flora.



INTELLECTUAL

Identifying high-value mānuka for honey production

Mānuka honey derives its high value from the bioactive properties of methylglyoxal (MGO), which is produced in honey by conversion of dihydroxyacetone (DHA) from mānuka nectar.

Identifying the genetic factors contributing to nectar DHA production will deliver gene-based tools to underpin rapid ecosourcing of high-DHA mānuka.

Plant & Food Research is partnering with an iwi and a new Māori collective to research high-DHA mānuka, including variations in mānuka from different regions.

DNA-based tools are being developed for selecting ecosourced mānuka plants that deliver high-DHA nectar for premium honey with verifiable local provenance. This should enable Māori landowners, agribusinesses and kaitiaki to realise the potential of their taonga while maintaining genetic diversity and exercising whakapapa.

In 2019, scientists at Plant & Food Research sequenced the complete genome of mānuka. The results were deposited with Genomics Aotearoa, ensuring the data are used for Aotearoa New Zealand's social, cultural, environmental and economic wellbeing.



INTELLECTUAL

Making more of our macadamia nuts

We grow good macadamia nuts and they have potential as a high-value crop for the northern half of the North Island – but we need to know more:

Can we shorten the time between planting and first commercial crop? What about more nutritional information on the varieties we grow?

We have joined an international collaboration of researchers to find out whether we can reduce that time to commercial crop. The project is funded by Horticulture Innovation Australia with co-investment from Plant & Food Research and Torere Macadamia Limited in Gisborne.

Torere is developing its macadamia business as part of the Māori economy, with new varieties that could deliver greater returns with higher yields and improved nutritional value.

The High-Value Nutrition National Science Challenge has contributed funding to help identify and verify the uniqueness and nutritional value of New Zealand macadamias which will help us develop innovative high-value macadamia products for local and export markets.



\$11.1M (6M)
Value of Māori aligned research

10% (10%)
Staff participation in
te ao Māori initiatives

BRACKETS INDICATE TARGET

Our researchers, including Alexandre Michel, Shane Maley, Mike George and Steven Dellow, are looking at the nitrogen requirements of vegetables as part of the MPI- and industry-funded project Sustainable Vegetable Systems.





Share /
Tuari



Our scientists, such as Aleise Puketapu, are developing new methods for managing pest insect species that damage key crops.

Profitable growth in science services

Our science is helping our customers create the world's best food production systems — addressing challenges including environmental sustainability, enhanced crop production, protection from pests and diseases, reducing waste, and understanding the consumer.

Our customers across the agrifood and seafood sectors – including government departments, industry bodies and commercial businesses – have very specific needs from our science to help them meet their strategic priorities.

We work with them to create R&D programmes that help answer some of the issues facing them now and in the immediate future.

Our international network means we can work with other science organisations to help customers with their global business, working with them in overseas markets to understand consumers and create resilient food supply chains.



Our scientists, like Dion Mundy, work in collaboration with customers to develop new tools and technologies that address key industry issues.

Successful funding applications

We apply for funding, either at an Institute level or in partnership with our customers, through the New Zealand Government's investment processes to support the development of research directly linked to our sectors' requirements.

In the 2020/21 financial year, Plant & Food Research was successful in a number of research funding applications.

- MBIE Endeavour Fund
 - Research programmes
 - Cyber-physical seafood systems: intelligent and optimised green manufacturing for marine co-products
- MBIE Vision Mātauranga Capability Fund
 - Innovations in koi processing for regional economic growth and environmental restoration
 - Te Ao Turoa – Intergenerational Resource Sustainability
- Marsden Fund
 - How do new pathogen incursions evolve during host infection?
 - From the road less travelled – how hornworts can help decipher the evolution of a fundamental stress tolerance adaptation of land plants
- MPI Sustainable Food and Fibre Futures
 - Reducing yield variability in process pea crops – with Process Vegetables New Zealand
 - Feasibility of growing hi-oleic peanuts in Northland – with Picot Productions Ltd
- MPI Productive and Sustainable Land Use Funding
 - Sustainable Vegetable Systems – with Potatoes New Zealand, Horticulture New Zealand, Onions New Zealand, Vegetables New Zealand, Processed Vegetables New Zealand and NZ Buttercup Squash

\$58.7K (46.2K)
Revenue per FTE
from commercial sources

0.75 (0.68–0.72)
Commercial reports
per scientist FTE

BRACKETS INDICATE TARGET



Honey bees are key pollinators, but adding other insects, such as flies and solitary bees, offers greater benefits through increased pollinator species diversity.

Many primary sector industries, including export fruits and seeds, which generate around \$2 billion in exports annually, and clover-based pastoral industries, rely primarily on managed populations of European honey bees for pollination.

Boosting diverse pollinator populations can increase crop yields while protecting them from the effects of climate change, providing such services under weather conditions unsuitable for honey bees. Strategies to protect and bolster a diversity of pollinators can also help protect tāonga plant species dependent on these pollinators.

Our studies of wild pollinators found the networks of non-honey bee pollinators offered more benefits than expected. Our research has taken this a step further by showing that native plantings based on plant-insect interactions can bolster our wild pollinators: a win-win for improving yields and protecting our native biodiversity.

A five-year funded programme from the Ministry for Primary Industries' Sustainable Food and Fibre Futures will enable our researchers to work with industry to increase pollinator diversity in production systems through designed native plantings that will lead to more resilient pollination services and increased biodiversity on our farms.

A combination of insects makes for better pollination

Boosting diverse pollinator populations can increase crop yields while protecting them from the effects of climate change.





Pruning and painting to protect grapevines

Grapevine trunk diseases (GTD) can wreak havoc in a vineyard. It's happened in France and California. It's happening here and it's threatening our extensive Sauvignon blanc plantings.

Between 2000 and 2015, Sauvignon blanc plantings increased seven-fold and now an estimated 80% of them are at risk of GTD with potential to significantly reduce grower returns and vine longevity.

Plant & Food Research has been researching ways to increase the long-term resilience and profitability of the industry with new approaches that will help growers gain traction against the diseases.

A three-year study commissioned by New Zealand Winegrowers Inc in 2013 showed that early adoption of preventive wound treatments and remediating infected vines offered two potential solutions. Further research in 2015 showed that minimising herbicide use and cane pruning predisposed vines to GTD. New data from 600 vineyard blocks now show the value of protecting all pruning wounds by hand painting or spraying fungicides after pruning.

Over the past year, Plant & Food Research has attended Grape Days to introduce vineyard managers to a new best-practice model. This includes visual monitoring and removal of dead wood, and wound protection when pruning vines less than 10 years old, which improves their longevity.

An estimated 80% of Sauvignon blanc plantings are at risk of grapevine trunk disease.



Research into grapevine trunk diseases (GTD) shows that wound protection can reduce the impact of the diseases and improve vineyard resilience.



Fooling leafrollers to save our avocados

Leafrollers damage our \$227 million avocado industry, but we've found a way to use their own sex pheromones to disrupt their breeding.

Mating disruption (MD) has worked in apples and pears; now we're investigating this cost-effective and environmentally sustainable tool to control four leafroller species, some of the most common pests of avocado and quarantine pests in a number of export markets.

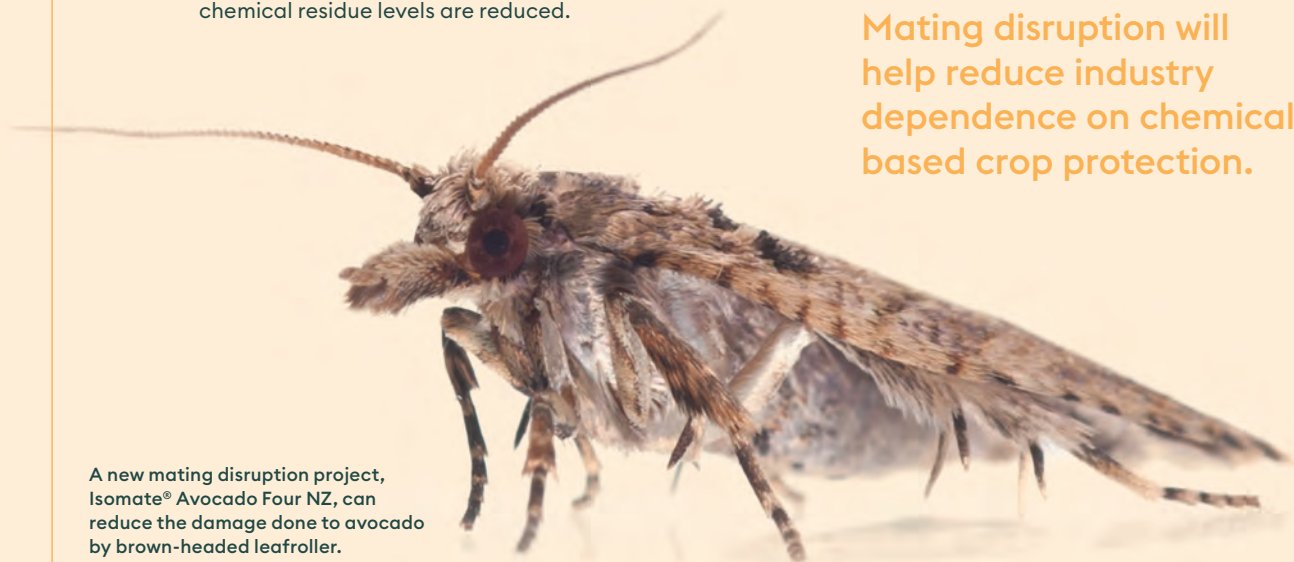
Plant & Food Research scientists and industry partners have developed Isomate® Avocado Four NZ, which uses synthetic leafroller sex pheromones shown to reduce populations within each season and increasingly over multiple seasons of use. It has the potential to increase export packout by reducing fruit damage, to reduce the use of pesticides and therefore the risk of residues in fruit, and to contribute to the value of the industry's Avogreen Integrated Pest Management (IPM) programme.

Growers can use pheromone traps to monitor leafroller numbers so they can make informed spray decisions.

MD will help reduce industry dependence on chemical-based crop protection, enhance the use of insect biocontrol agents, safeguard key ecosystem services such as pollination, and protect export market access as chemical residue levels are reduced.



Mating disruption will help reduce industry dependence on chemical-based crop protection.



A new mating disruption project, Isomate® Avocado Four NZ, can reduce the damage done to avocado by brown-headed leafroller.



Bees have been described as the backbone of yields in our agricultural and horticultural sectors, making it vital we protect their health for our \$425 million honey export industry and the wider economy.

However, bees are susceptible to parasites, most recently *Nosema ceranae* which may be the culprit of significant colony losses, particularly in Coromandel in 2014-2015.

Where there are other stressors, *N. ceranae* can weaken colonies and contribute to their failure. This pathogen is known to reduce bee longevity, numbers and honey production overseas.

Plant & Food Research worked with geneticist and commercial beekeeper Dr Oksana Borowik in

Coromandel to find a solution. We developed a low-cost, non-chemical approach: honey bee wax comb is heated to 50°C for two hours, killing off the pathogen, before re-occupation by the honey bee colony. This treatment increased brood viability, adult bee numbers and honey production.

This heat effect on *N. ceranae* has been previously reported, but our work appears to be the first to quantify the effects of heat treatment to manage *N. ceranae* in an apiary.

We believe this will help protect our export honey industry, and the horticultural crops and pastures which depend on honey bees as pollinators.

Putting the heat on a honey bee pathogen

Our researchers, including Ashley Mortensen and Sacchi Shin-Clayton, develop treatments to protect honey bees against parasites, including *Nosema ceranae*.





UPL New Zealand Ltd's George Follas and Plant & Food Research Business Manager Greg Pringle celebrate the successful commercialisation of the co-developed biocontrol product Aureo®Gold.

A world-class technology development business

We are never short of ideas. Sometimes it makes sense for us to use science and commercial expertise to take these ideas from concept through to a finished product. Sometimes we may decide we need a partner to co-invest and add their knowledge and commercialising capability into the mix. Other times, we may decide we've done what we can and need alternative ways to take our idea through to market. If that is not looking likely then we pass it back into science to generate new science knowledge.

Through our Technology Development (TD) portfolio we invest in the development of new products or technologies that will have real-world impact. We aim to maximise Plant & Food Research's share of the value created, through well-defined routes to commercialisation such as licensing, partnerships or new commercial ventures.

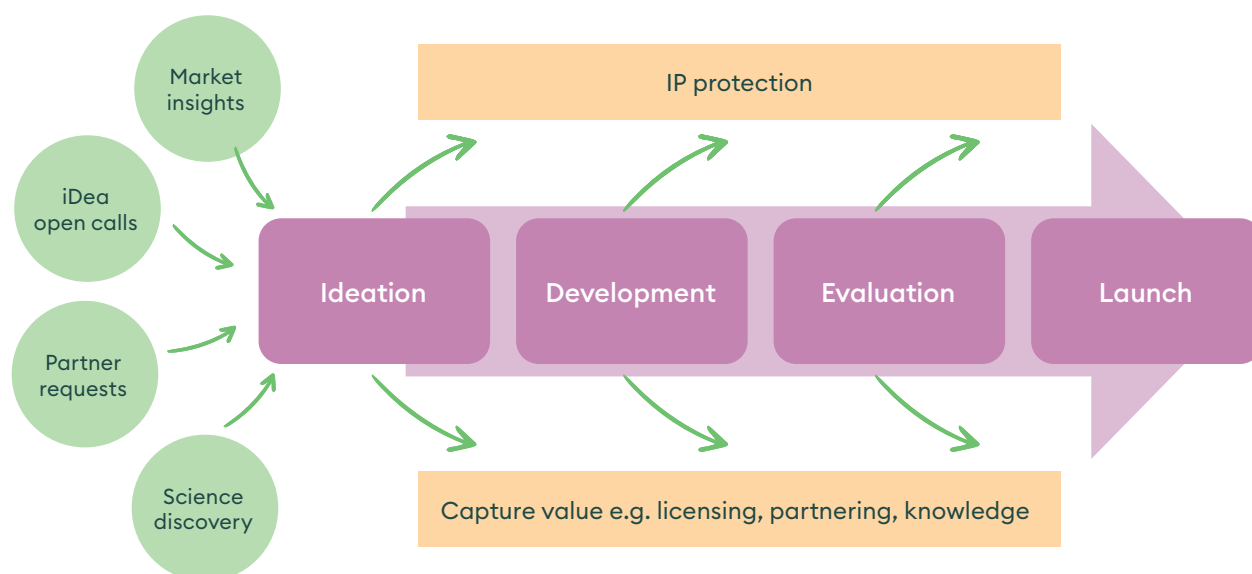
Our pipeline includes a wide range of TD "Missions" – including targeted breeding of crops, new technologies for pest and disease control, machine-learning software for integrating into digital food production and supply chains, and new food concepts. We have a range of new products and technologies at points across the pipeline.

From ideation to reality

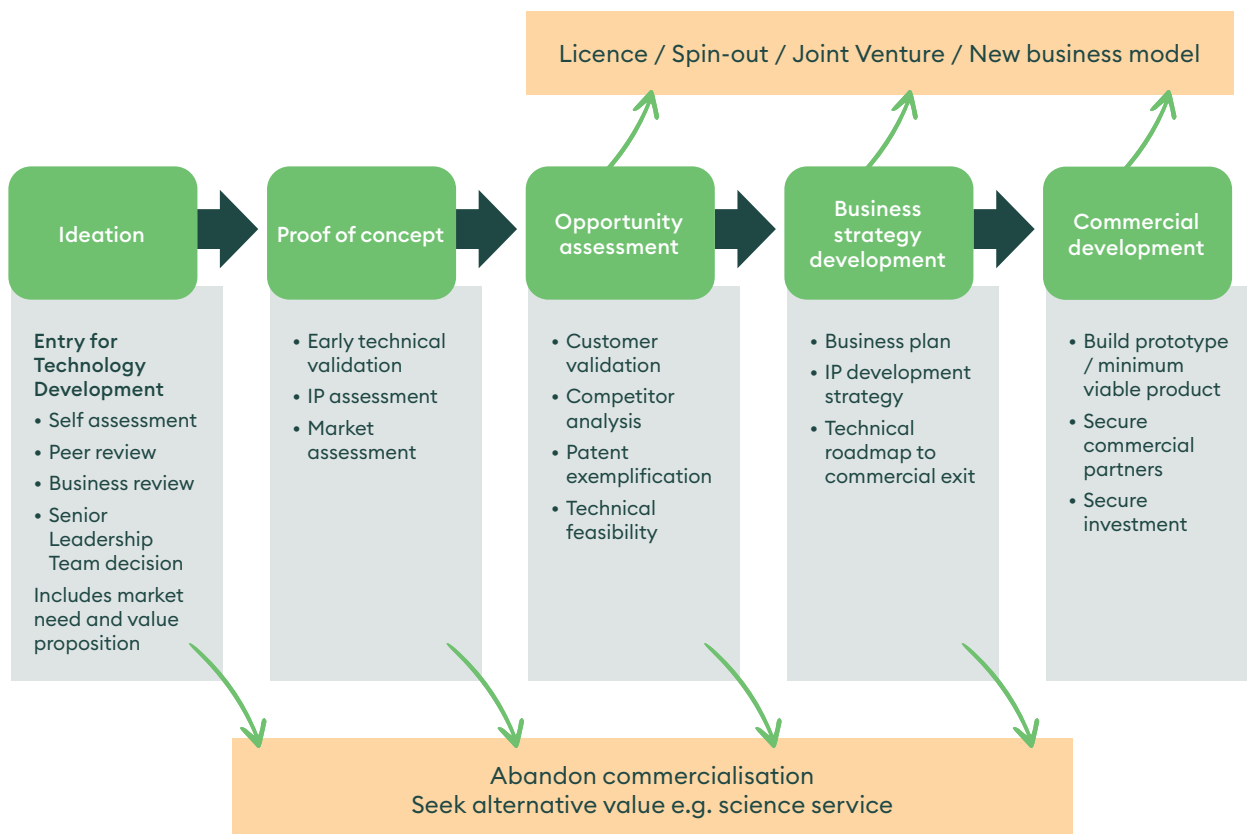
Using a licensed software platform adapted for our own purposes (iDea) we run an open innovation system across the Institute for the filtering and selection of Missions to invest in. This system is designed to bring transparency to the ideation process and provide a means of whole-of-organisation/peer review so that we can capture the full value of the collective knowledge and expertise within our organisation. It also brings a means for making more robust selection of investable opportunities based on a final step – the verbal pitch to senior commercial leaders.

Each Mission has a development timeline, with key stop-go points identified to support a "fast-fail" development process. Where possible we make full use of co-investment vehicles, such as KiwiNet or MBIE's PreSeed Accelerator Fund (PSAF), to further develop these Missions.

Our Technology Development pipeline



Our pathway to commercialisation



INTELLECTUAL

Examples of current Missions

How an insect smells opens up billion-dollar global market

Unravelling how insects smell has led to a ground-breaking discovery – synthesized insect receptors can be used to smell and taste chemical compounds.

This research was done by Plant & Food Research and is the basis of start-up company, Scentian Bio, which aims to develop completely new sensor technologies for commercial applications in medical, food or industrial settings.

Plant & Food Research partnered with Sprout to spin out Scentian Bio with a \$1 million investment from Sprout and Callaghan Innovation's Tech Incubator Programme. Scentian Bio will target the flavour and fragrance sectors where the technology could be used to analyse the composition and quality of food ingredients. This represents a \$1 billion global market opportunity.

Scentian Bio is a great example of how research from Crown Research Institutes can be developed into a commercial success, taking fundamental science through to where it can deliver value in the real world.



Knowledge of how insect antennae process smell has led to the development of a new sensing technology spun out of Plant & Food Research to establish Scentian Bio.



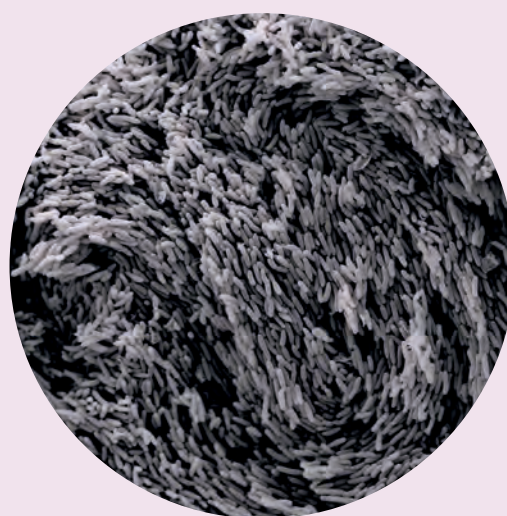
Test a success for kiwifruit industry

The kiwifruit industry is now exporting more kiwifruit than before the Psa outbreak, helped by research and innovation from Plant & Food Research scientists.

The November 2010 discovery of *Pseudomonas syringae* pv. *actinidiae* cemented collaboration within the industry and across government and science. Our research helped the industry make confident decisions to help control Psa's spread, provided mitigation strategies for growers, and produced new tolerant cultivars.

There were no molecular tools for rapid identification of the more virulent biotype from field samples, making the process relatively slow and labour intensive. Industry representatives asked us to develop a fast, sensitive test that did not rely on culturing bacteria – and we delivered. Our test quickly identified disease states in orchards, so decisions could be made confidently on controlling the rapid spread. That test is still useful today to identify incursions of non-New Zealand Psa strains on kiwifruit's Most Unwanted list. More importantly, our collaboration with breeders has developed future potential Psa-tolerant cultivars.

By 2015, kiwifruit exports of nearly \$1.2 billion exceeded pre-Psa levels. By 2020, those returns were over \$2.5 billion and between 2015 and 2020, export values more than doubled. Alongside this, confidence and investment in the industry continues to grow.



A new rapid identification test for kiwifruit disease Psa (shown at 600x magnification) helped growers make quick decisions on how to manage their orchards.

Local solution to global problem

A biocontrol product with global commercialisation potential marks a milestone in efforts to fight *Pseudomonas syringae* pv. *actinidiae* (Psa) in kiwifruit.

Aureo®Gold, containing the naturally-occurring yeast-like fungus *Aureobasidium pullulans*, is an environmentally-friendly option to help manage Psa: safe for bees, can be used during flowering, and meets low-residue export requirements.

The global biocontrol market is projected to reach US\$2.9 billion by 2024, fuelled by the growing consumer-led demand for food safety and increasing area under organic farming, as well as the continuing loss of traditional fungicide options.

With kiwifruit production areas globally affected by Psa, there is a significant potential market opportunity. Developed in partnership with Zespri, Kiwifruit Vine Health (KVH) and UPL New Zealand Ltd, Aureo®Gold has been available for New Zealand growers since 2018, and is now widely used by the kiwifruit industry. Plant & Food Research and UPL have begun commercialisation offshore, where kiwifruit are grown on more than 400,000 hectares.

Plant & Food Research and UPL are also exploring the expansion of Aureo®Gold for other disease targets through complementary trials in several countries, with a commitment to register the product accordingly.



The name is a bit of a giveaway — ‘HOT84A1’ — but this apple is different. It’s the first release from the New Zealand-Spain collaborative Hot Climate Programme (HCP) tailored for growing in hot climates.

Apple growers in the Catalonia province of Spain had major problems growing traditional apple cultivars in their warm growing region. We were invited to collaborate with Catalonia’s Institute of Agriculture and Food Research Technology to breed new apple and pear cultivars for hot climates. Catalan grower group Fruit Futur joined the partnership in 2003, and T&G Global (managed through its VentureFruit business) as the strategic commercialisation partner in 2019. ‘HOT84A1’ was first planted commercially, in Spain, in 2020.

The elite selections in HCP will ensure that apples and pears with the taste, texture and visual appearance sought by consumers will thrive as the world’s climate warms. It may also create new opportunities for growers in areas that are currently too warm for apple production.

The release of ‘HOT84A1’ is the first step towards ensuring that Plant & Food Research, in a warming climate, retains its reputation for breeding high-quality apple and pear cultivars that sell for premium prices in export markets.



‘HOT84A1’ is the first cultivar to be released from the Hot Climate Programme, a collaboration to develop new apples and pears tailored for high-temperature growing regions.

A hot new apple

A sweetener from crabapple leaves

Trilobatin is a high intensity, natural (plant-derived), non-nutritive sweetener. It is much sweeter than sucrose but without the calories.

It is found at high concentrations in the leaves of a range of crabapple species, including *Malus trilobata*, *M. sieboldii* and *M. torino*, but not the domesticated apple (*M. domestica*).

Scientists at Plant & Food Research have identified the gene that encodes a key enzyme required for the production of trilobatin. They have filed a patent covering the use of this gene in the production of trilobatin using different methods with potential for large-scale production. These may include biofermentation, biopharming, and producing novel plants through gene editing or breeding techniques.

Trilobatin has recognised potential as a natural high-intensity sweetener, and new tools to produce it at commercial quantities will help to address one of the key current barriers to uptake. The project is at development stage and Plant & Food Research is engaging with the market for further insights and to identify potential commercialisation partners.

A better way to catch fish

After nearly 10 years of research, Tiaki Precision Seafood Harvesting technology is on the commercialisation pathway.

Plant & Food Research scientists partnered with Sealord Group Ltd, Sanford Ltd and Moana New Zealand to develop the Tiaki modular harvesting and handling system, which modifies traditional trawling nets with a soft membrane. The goal is to help maximise value from catch limits and allow more selectivity with species and size.

Global wild capture fisheries are facing mounting pressure to become more sustainable and selective and Tiaki has the potential to address this global market opportunity and change the way the world fishes.

We are seeking further investment from the government’s Sustainable Food and Fibre Futures fund to support Tiaki over the next three years as it validates the benefits, refines the technology, develops the brand, and conducts trials in potential international markets.

Tiaki, meaning ‘care’ in te reo Māori, will enable commercial fishing to continue while also protecting marine resources for future generations.

7

Patents granted

6

Plant Variety
Rights granted
New Zealand

19

Plant Variety
Rights granted
international

15

New licences

\$37.6M

(\$35M)

Value of portfolio
of investment

\$2M

(\$1.8M)

Investment in at
least 10 early stage
TD programmes

BRACKETS INDICATE TARGET

How green, is your gold?

Plant & Food Research scientists have developed an accurate and inexpensive method of measuring kiwifruit colour.

They modified the 'Cube', a portable colour digitizer device developed by Melbourne design collective Palette for measuring paint colour, to provide Zespri staff in export markets with quick accurate assessments of kiwifruit flesh colour. Until recently, the only option was a US\$10,000 chromameter, whereas the Cube retails for about US\$139.

The internal colour of kiwifruit, particularly gold-fleshed kiwifruit, is critical in consumer choice. Gold-fleshed kiwifruit can develop 'greening' of the flesh under the skin, making them unacceptable to consumers.

Export fruit must comply with stringent Zespri grade standards, with colour checked both in New Zealand and at the destination.

The Cube, about the size of matchbox, measures the amount of green, blue and red light in the flesh and is said to be accurate to colour differences not usually perceptible to the human eye.

In 2019/20, an engineering summer intern at Plant & Food Research evaluated two newer to-market devices against the Cube, but they did not perform as well. Instead, we enhanced the Cube with a protective glass cover and with software to store and download data to help with analysis.

Zespri is now trialling 10 Cubes in overseas markets.



INTELLECTUAL

IMPACT CASE STUDY

Our future-focused research is developing the technology needed to breed and grow native species, such as snapper, in the open ocean.





Invest /
Whakangao



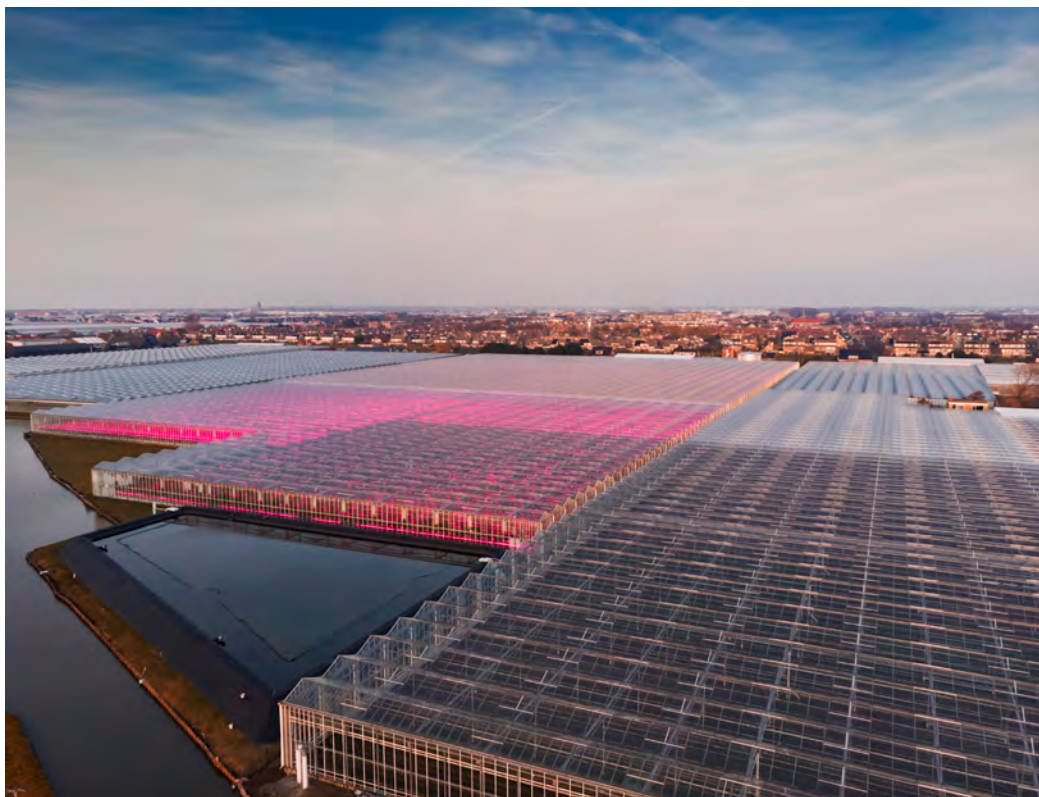
Our researchers, including Robert Schaffer and Bouche Jacques-Joseph, are investigating how to grow crops tailored for urban environments.

Investing in future science

The world is changing, with more people, shifting diets and a greater awareness of the impact humans are having on the planet. Our science needs to make sure that producing nutritious, tasty foods remains sustainable for future generations.

We have thought about how our science could help create more sustainably produced food for future generations. We have chosen areas of science in which we think Aotearoa New Zealand can lead the way — our Ngā Pou Rangahau Growing Futures™ Directions.

Our Horticultural Production goes Urban Direction is looking at how to grow plants in increasingly urbanised areas, including in glasshouses.



Each of our Ngā Pou Rangahau Growing Futures™ Directions is focused on creating science for what we think Aotearoa New Zealand, and the world, will need in 20 years' time. We've come up with some big ideas and have long-term research plans that will help make these a reality. If for some reason we never reach, or need, our ambitions, we're still confident that each small step will create new technologies and scientific expertise that will help our industry partners better prepare for the future.

Our Growing Futures™ Directions — Ngā Tohu Pūtaiao

Horticultural Production goes Urban — Hua ki te Ao:

creating the plants and systems needed to grow plant-based foods close to where people live

Sustainability & Provenance Wins — Tuia ki te whenua:

creating new food production systems that do more than just produce food – they also give back to people and place

Open Ocean Aquaculture — Ngā Tai Hōhonu:

understanding how to raise healthy fish in captivity in the open ocean.

We also invest in biosecurity research through the Better Border Biosecurity (B3) collaboration. This collaboration is vital in keeping New Zealand flora and fauna safe from invasive pests and diseases into the future.



INTELLECTUAL

Horticultural Production goes Urban — Hua ki te Ao



By 2050, the global population will increase by an extra two billion people, and almost two-thirds of people will live in cities. What they will eat and where it comes from will have to change, particularly as we try to reduce the environmental impact of our food production.

One solution is to start growing food closer to the majority of the population, across the city landscape. It's reasonably common for inner city dwellers to have herbs, micro-greens and salad vegetables growing on their rooftops, balconies and windowsills. But what if we could create inner-city orchards and farms, selling their produce directly to their neighbours or where people could pick their own fruits, berries and vegetables throughout the year, no matter the season.

Creating a city farm requires a major shift in technology, which we're investigating in our Horticultural Production goes Urban Direction. We're looking into how we can grow fruits in compact, covered environments and produce food continuously. Once we have the right crops, we'll need to figure out the best way to grow them – the right light source, temperature, and water and nutrient requirements – and build new technologies to look after the plants for us.

While Aotearoa New Zealand is unlikely to have mega-cities, we could be the suppliers of unique technologies to the world. Our industries would provide the technology, the plants and the instruction manuals for those setting up city orchards and farms, selling our knowledge to the world and feeding the planet nutritious, healthy fruits and foods.

Hua ki te Ao – by developing sustainable indoor production systems we take our fruits, products, benefits and abundance (hua) to the cities of the world (ki te Ao).

Direction Leader: Samantha Baldwin

Māori co-lead: Jenny Green

Research Programmes (started 2019/20):

- Future urban consumers (Lead: Denise Conroy)
- Traits for life indoors (Kim Snowden)

Research Programmes (started 2020/21):

- Overcoming pollination barriers (Jia-Long Yao)
- New growing units (Nick Gould)
- New plants for a new world (Helen Boldingh and Falk Kalamorz)



INTELLECTUAL

Sustainability & Provenance Wins — Tuia ki te whenua



Food production uses around half the planet's habitable land and 70% of the world's fresh water, and is a major contributor to greenhouse gas emissions. By 2050, feeding a population of more than nine billion people will require a 50% increase in agricultural production and 15% increase in water. Growing more food while we try to reduce the impact we have on the planet is a huge challenge.

As consumers, we have a perception of the origin of our food based on the rules – set by local, regional and national authorities – that limit the impact that food production can have on land, water and the environment. But we now want to know more than just where our food comes from – we want the full story of how our food is produced, so we can choose the products that best meet our personal values. We want food that doesn't negatively affect the environment or the people involved in its production.

Making food production systems do more than just produce healthy and sufficient food, but actually enhance the environment and the community, requires a new way of thinking. Our Sustainability and Provenance Wins Direction will create new food production systems that give back to people and place. These systems will restore the natural environment while producing better foods, as well as creating new high-value jobs as we build the workforce needed to manufacture and maintain new technologies. We'll also create new ways of monitoring how food is grown, stored, transported and sold, so we know what we're growing is exactly what consumers want, and linked to all the information they need about how their food was made.

Consumers around the world will want to buy, and pay more for, New Zealand foods as they will be certified as highly environmentally sustainable, as well as telling the stories of how producers provide for their staff and protect local communities and environments.

The Māori proverb “Tuia ki te rangi, tuia ki te whenua, tuia ki te moana, tuia te here tangata” acknowledges our relationship to the land (whenua), oceans (moana) and te taiao, the wider environment.

Direction Leaders: Paul Johnstone and John Mawson

Research Programmes (started 2019/20):

- Digital twins – designing the framework (Lead: Jo Sharp)
- The lightest tread (Beccy Ganley)
- Rejuvenating crop ecosystems (Robin MacDiarmid)
- Ambient supply chains (Jason Johnston)

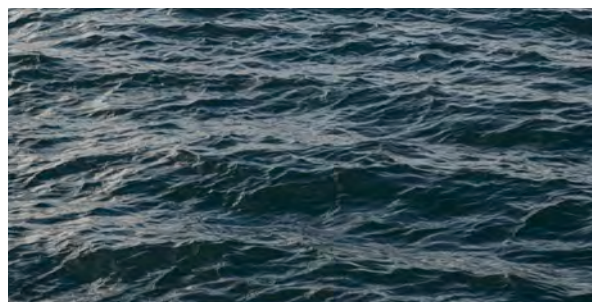
Research Programmes (started 2020/21)

- Stakeholder values and metrics (Toni White and Roger Harker)
- Digital Twins of Future Food Systems (David Pattemore)



INTELLECTUAL

Open Ocean Aquaculture — Ngā Tai Hōhonu



Seafood is widely recognised as a nutritious source of protein, and by 2030 we will need to produce more than 200 million tonnes to feed the growing global population. Sourcing fish from wild populations is limited and warming seas due to climate change means that areas currently used for aquaculture may become unusable. Keeping seafood in our diets means we must find ways to grow fish sustainably in new regions and new ways.

Aotearoa New Zealand is an island nation with a large ocean territory. As a people, we have a special relationship with the sea, which is home to unique fish species not found elsewhere in the world. The ocean is a wild place, and different fish species behave in different ways, swim at different speeds, prefer different water depths or temperatures, and feed on different foods.

To extend aquaculture into the open ocean we need to understand what each fish species needs and how they behave, so we can create homes that keep them healthy and safe.

Our Open Ocean Aquaculture Direction will develop aquaculture systems that work with nature, rather than against it. We will breed fish to live in these systems and create new technologies that make sure they have everything they need to thrive, within systems that monitor the environment. In the future, we'll also look at how we can create systems to grow other marine species – like seaweeds and shellfish – and how we can make sure we're making the most of everything we grow.

Aotearoa New Zealand will be a world leader in open ocean aquaculture, providing new technologies and sustainably produced fish to the world.

Ngā Tai Hōhonu – developing open ocean production systems in the deep seas (ngā tai hōhonu).

Direction Leader: Damian Moran (appointed May 2021); Suzy Black (stepped down May 2021)

Māori co-lead: Barney Anderson

Research Programmes (started 2019/20):

- Appropriate species selection (Lead: Peter Morrison-Whittle)
- Aquafeed (Damian Moran)
- Performance Measurement (David Ashton)

Research Programmes (started 2020/21):

- Research in the open ocean environment (Damian Moran)
- Species selection framework (Hemi Cumming)

New Direction under development

Plant & Food Research is investigating the potential for a new Ngā Pou Rangahau Growing Futures™ Direction that specifically focuses on creating an integrated suite of models to analyse and simulate production and supply chain performance across the horticultural sector. This new Direction would probably incorporate and expand upon existing research into digital twins, ultimately allowing the sector to future-proof activities based on changing climates and environments in Aotearoa New Zealand.

Better Border Biosecurity (B3)

Keeping New Zealand free from damaging pests, pathogens and weeds from overseas is important in safeguarding our horticulture, agriculture and forestry industries, and our natural plant systems. Not only can these invasive species devastate crops, but their presence can result in overseas countries refusing to accept our food and other exports.

The Better Border Biosecurity (B3) collaboration creates new knowledge and technologies to strengthen the New Zealand border and protect valued plant systems. This science is used to understand how new pests, pathogens and weeds could affect New Zealand flora, as well as finding new ways for border agencies to detect and respond to those that reach or cross our borders.

Plant & Food Research is leading two new projects funded by B3 from July 2020. These are:

- *Xylella fastidiosa* and its vectors in the native estate (led by Jessica Vereijssen), with Manaaki Whenua Landcare Research
- Prospects for the future of fumigation research: a comparative review (led by Kambiz Esfandi).

Plant & Food Research is also a collaborator, with Scion and AgResearch, in the newly-funded project 'Global change and New Zealand biosecurity: risks and economics of future climates and change patterns'.



In February 2021, Plant & Food Research's Alby Marsh was appointed as B3's first Māori Research Leader Pourangahau.



Ensuring our science quality

The quality of our science underpins all our activities. We have a network of collaborators, across New Zealand and internationally, that allows us to access the best teams and facilities globally to support our own research activities. We routinely benchmark our research against the world's leading science organisations, guided by our Science Advisory Panel (see page 65), to ensure we continue to deliver the best science for our customers and our partners.

In the 2020/21 year, we undertook one science review on vining pea breeding and cultivar development. No other reviews were undertaken owing to the COVID-19 pandemic.

We also host internal workshops that provide our scientists with the opportunity to learn from one another about research activities and to identify potential areas for collaboration. Owing to uncertainty related to COVID-19, no in-person forums were organised; however, the science team has used Zoom for regular pan-Institute seminars to discuss and share their research activities. In July 2020, we held an online workshop on new biotechnologies to help inform our scientists developing funding applications for the MBIE Smart Ideas bidding round. We also ran an All Science Connect virtual internal conference (March 2021) and a virtual Emerging Career Researchers forum (October 2020).

4.10 (2.8–3.0)
Impact of science
publications
(SciMago)

3 (5–15)
International
awards

19 (20–40)
Invitations for
international
committees

17 (5–15)
Invitations for
editorial boards

2 (1–2)
Cross cutting
workshops

18% (8–17%)
Research activities
aligned with
Growing Futures™

BRACKETS INDICATE TARGET

Farmers growing fodder beet are maintaining yields with significantly less fertiliser and at a much lower cost thanks to a project involving Plant & Food Research scientists and industry partners.

Fodder beet is a valuable high-quality feed for wintering dairy cows and other livestock and helps achieve good growth rates in beef and lamb finishing, but gaps in understanding around good management practices for farmers result in highly variable crop performance.

Plant & Food Research scientists joined up with industry partners, supported by funding from the MPI Sustainable Farming Fund (SFF), to consolidate existing agronomic knowledge information, test and refine new practices, and engage farmers in validating the results.

Farmers now have a set of good management practices, enabling them to produce consistently high yields with significantly less fertiliser, particularly nitrogen and potassium. There's potential to reduce fertiliser costs by more than \$800/ha, and ultimately, total production costs by around 25%.

Evidence that fodder beet is a low-nitrogen crop is particularly valuable for farmers, including many in Canterbury and Southland who must reduce estimated nitrogen leaching to comply with regional regulations.

Less is more with fodder beet farming



Our researchers, like John de Ruiter and Brendon Malcolm, have developed guidelines for fodder beet production that have reduced costs by around 25%.



Our rolling capital expenditure plan ensures our sites across Aotearoa New Zealand, such as the Mt Albert Research Centre, have the specialist facilities needed to deliver our science.

Investing in facilities & information

We know ideas need the right environment to flourish. Providing the right tools, equipment, technology and resources is the best way we can help our staff do what they do to the best of their abilities. We have long-term plans to make sure our infrastructure is constantly refreshed so we have the specialist facilities, leading-edge equipment and information management systems that we need to deliver world-class science for our customers.



MANUFACTURED

Capex investment remains at \$300M

Our first long-term capital plan (LTCP), developed in 2019, proposed investing around \$300 million over the following 10 years in areas such as land, buildings, specialist science facilities and equipment, digital technologies, vehicles, and farm and orchard equipment.

A refresh of the LTCP retains that investment at circa \$300 million for the next 10 years but with a change in the mix and sequencing of projects, such as increasing the allocation to specialist science facilities and science equipment to around \$150 million.

The next 12 months will see significant infrastructure investment on projects including:

- Starting a major redevelopment at our Te Puke site
- Completing the construction of a flume tank at our Nelson site (see below)
- A new glasshouse development at Motueka
- Refurbishment of the café/lunchroom and other common amenity areas at Lincoln
- Starting phase 2 of the Mt Albert redevelopment project.



MANUFACTURED

Going digital for communications and collaboration

Digital technology is an essential tool, enabling good communications and collaboration, and supporting mobility and remote working for our geographically distributed teams. This aligns with the New Zealand Government's 'Cloud First' policy which enables agencies to take advantage of emerging technologies to drive innovation and deliver greater value.

Adopting Microsoft® 365 cloud-based services was central to our recent upgrade. We replaced older technology in our data centres with 365, introduced content backup and recovery services, increased security through Multi-Factor Authentication, installed a newer version of Microsoft Office across staff computers, and migrated all email to Exchange online. We also upgraded to Microsoft Teams Meetings after Skype™ struggled with congested internet infrastructure during COVID-19 lockdowns.

Microsoft 365 services can easily match our peak demands while providing highly resilient service with technical support. Future projects will include a new intranet, adoption of OneDrive file storage, and adopting Teams Telephony and collaboration services within the Teams Suite.



MANUFACTURED

Learning about ocean waters from a tank of water

New approaches to aquaculture could help us make better use of our open ocean waters for finfish farming, relieving pressure on inshore waters and generating sustainability and environmental benefits. However, moving into more exposed oceanic environments will require the development of new technologies which require rigorous testing.

Computer modelling will only take us so far and eventually engineers need to physically test novel structures in a controlled environment. Just as car designers test new automobile designs in a wind tunnel, aquaculture technologists use a flume tank to test the hydrodynamic performance of novel aquaculture structures.

Plant & Food Research is investing in a medium-sized flume tank, approximately 16 metres long and 5 metres wide, holding over 250,000 litres of water. Once we have a better understanding of how structures perform in a controlled environment such as a flume tank they can then be tested in the field – or in this case, the sea.



MANUFACTURED

New research facility in Te Taihū

A revamp of our site at Riwaka, near Motueka, has involved construction of a new 1430m² building that combines with existing facilities to create more than 2800m² of purpose-built laboratories and crop-handling facilities, offices and shared meeting spaces.

Our Motueka Research Centre is home to more than 55 staff who work on important local crops such as hops, kiwifruit, apples, pears and berryfruit. It also includes a 36-hectare research orchard. The new building replaces several buildings, some of which dated back to the 1950s.

Upgraded facilities and purpose-built laboratories will enable us to do more to support the growth of local high-value horticultural industries. The upgrade has brought the laboratories up to international standards and will help attract top researchers from around New Zealand and overseas.

The new facility is a part of a development by landowners Wakatū Incorporation to support the growing agrifood industry in the Tasman region.

\$14.5M (\$19.8M)
Expenditure against milestones
in long-term capital plan

BRACKETS INDICATE TARGET



Entomologist Asha Chhagan is one of nearly 1,000 people working at Plant & Food Research towards a smart green future for Aotearoa New Zealand.

Investing in people

Our performance and reputation as a good employer is underpinned by our commitment to fostering a positive workplace culture that is characterised by three shared values:

- The creative application of our knowledge
- Achievement through leadership
- Relationships based on mutual respect and trust.

Our values capture what is important for us and provide a framework for our people-related initiatives and decision-making.

We are committed to equality of opportunity, and a culture of belonging for all through all aspects of the employee experience: recruitment, selection, promotion, conditions of employment, and career development for current and prospective employees.

We view our workforce, comprising people from many different cultures and nationalities, and with a diversity of characteristics, as a strength that aligns well with the increasingly international nature of our research and development programmes.

Best practice recruitment, selection and induction

We use best practice selection procedures for all appointments, with line managers being supported throughout the selection process by our HR Advisory team. All vacancies are advertised internally to provide opportunities for career development and advancement. When advertising externally we use web-based technologies to access a diverse range of communities and candidates. A comprehensive induction and orientation programme ensures all new recruits are supported to become effective contributors as early as possible.

In 2020/21 we appointed 89 people to vacant roles from 16 different nationalities (44 female, 45 male), including 30 from within the organisation.

Promoting equal diversity and inclusion

Our EDI work is directed at increasing the percentage of women at senior levels, both in science and in other areas of the Institute, and increasing the opportunities for groups who are historically under-represented in our workforce including Māori and people with disabilities. Progress is reviewed annually through a set of workplace demographic metrics and data covering gender, ethnicity, nationality and disability collected from new recruits.

The proportion of senior women scientists including those in group leadership roles continues to increase, largely through internal promotions, and we expect that further progress will continue to be made over the next decade as significant numbers of our senior scientists retire.

Our Māori business unit Te Rāanga Ahumāra is focused on leading the implementation of Māori research and innovation objectives. This is supported by performance indicators for developing capability and increasing understanding within Plant & Food Research and among Māori regarding the opportunities to work more closely.

Our annual Summer Studentship Programme provides promising science students from across New Zealand with their first experience of working in science. In 2020/21, 18 of the 36 studentships were awarded to Māori and Pacifica people as part of a broader initiative for increasing participation from groups that are under-represented in the science workforce.

Progressive conditions of employment

The Plant & Food Research General Terms & Conditions of Employment include provisions promoting equal employment opportunities, career development and employee participation in the development of the workplace. They provide a wide range of benefits including superannuation, medical insurance and generous leave provisions supporting work:life balance and whanau/family commitments.

Our partnership agreement with the PSA serves as an effective mechanism for involving staff in the ongoing development of a high-quality work environment, in line with the principles of partnership and EDI.

Additional paid parental leave, on-site child care facilities at our larger sites and flexible and part-time hours of work enable people to balance their work and family responsibilities and minimise disruption to their careers. 18% of our salaried staff work part-time, including a significant number who have reduced their hours while they care for dependents.

Career and associated remuneration structures utilise standard job evaluation methodologies and peer review to ensure equity and transparency in both pay and progression opportunities. The historic pay gap between male and female science staff is reducing, with median female pay rates now at 99% of the median pay rates for males across the eight science salary ranges. This ratio is repeated across the six salary ranges for general staff.

Staff working towards retirement have the option of progressively reducing their hours and responsibilities.

Retraining and outplacement support are available to staff affected by change in the workplace.

904.9 (934)
FTEs

12 (>12)
Pulse workplace surveys

BRACKETS INDICATE TARGET

Engaging our people

Plant & Food Research engages in continuous pulse surveying as the primary way of measuring engagement. A sample of staff are invited to complete the survey each month (linked to their birthdays). This method of surveying allows us to continually track engagement levels and see trends as they emerge.

These trends saw increased engagement levels through the COVID-19 lock-down period (March–May 2020) continuing through to August 2020. Engagement levels then returned to pre-COVID-19 levels for the remainder of 2020. Over the last few months February to June 2021 we have seen engagement levels trending down. Discussions with staff revealed uncertainty associated with changes in the science funding landscape and the implementation of a new science strategy. This uncertainty is a high priority for the Senior Leadership Team to address.

The pulse survey data provide a platform where Plant & Food Research can understand shifts in engagement in almost real time, and creates an opportunity for us to focus attention on solutions and improvements. This has proved particularly useful as Plant & Food Research works to implement the Smart Green Future strategy in the context of a rapidly changing external environment.

Developing potential

Our strengths-based Leadership Programme provides development opportunities for current and future leaders at all levels of the organisation.

Over the past year, 58 people have participated in the Cornerstones of Leadership programme, which is targeted at people who have yet to have line management responsibilities. A further ten participated in a new Team Leaders programme, a series of four virtual modules designed to support leaders taking responsibility for leading a team or group of people for the first time. The modules explore the team leader role and highlights tools for developing others and creating high performing teams.

We have continued to implement an internal mentoring initiative, with a further 27 new mentoring relationships established over the last year, bringing the total number of mentoring relationships established to more than 70. The mentoring programme has a focus on clarifying career aspirations, creating a development plan and enhancing support networks. The mentoring relationship is actively supported over a one-year period. Our mentoring initiative recently won the top award for Learning and Development capability at the national HRINZ awards.

Over the past year we have given increased attention to supporting our leaders to stay highly connected and support their teams, particularly through lockdowns

and increased virtual working and collaboration post lockdown. All our 150 leaders participated in virtual workshops to explore tools and share ideas to effectively lead and stay connected during this significant change to our ways of working.

A safe and healthy culture

Following recommendations from an external audit of the organisation's safety culture in 2017, the Institute was encouraged to ensure our people were more actively engaged in their health and safety. To this end there are now 11 Critical Risk Groups, with participants drawn from staff who work in specific areas or circumstances, under the sponsorship of a senior leader, engaging in developing and monitoring controls in areas that pose the greatest health and safety risks.

During 2020 two new Critical Risk Groups were established, focusing on reviewing and improving Business Continuity and Emergency Response Planning, along with a critical risk group to focus on Mental Health & Wellbeing.

The National Health & Safety Committee, comprising staff specifically trained as health and safety representatives and Management representatives, is responsible for reviewing the Institute's health and safety progress, in line with continuous improvement principles. The programme includes safety and wellbeing objectives developed by the local health and safety committees drawn from staff at each of the Institute's sites.

The Seafood Technology team engaged an external marine safety consultancy to audit Plant & Food Research seagoing activities with an outstanding result, reflecting the Seafood team and management dedication to safety.

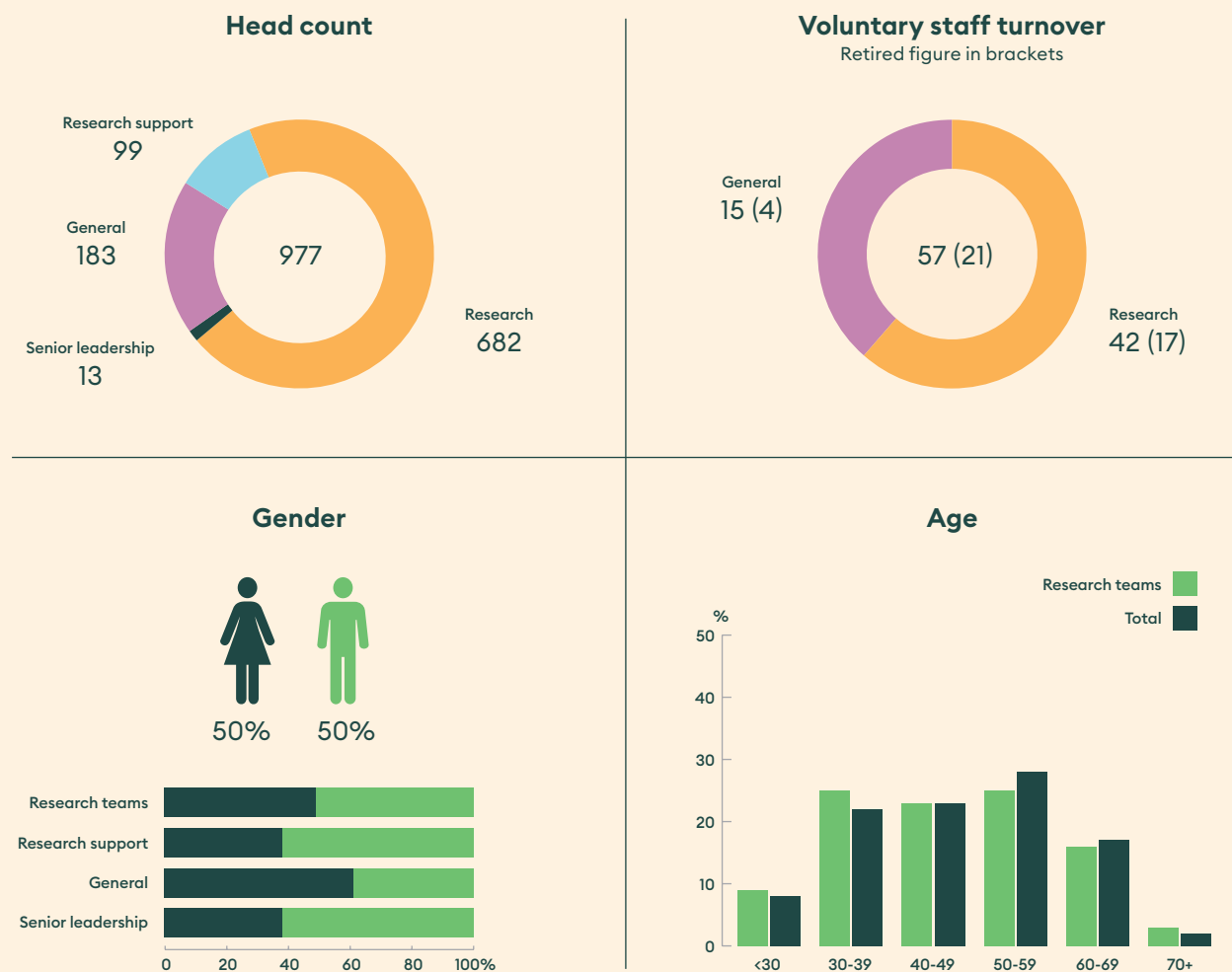
The Institute's ongoing efforts are also reflected in staff members' willingness to participate in Critical Risk Groups, active involvement in health and safety committees, and improvements in reporting of near-miss incidents with close follow-up by Management.

Our Code of Conduct & Ethics and Policy on Unacceptable Behaviour define those actions including harassment, bullying and unlawful discrimination that will not be tolerated, and they provide processes for responding to situations where unacceptable behaviour may have occurred. A network of trained contact people provides confidential support and advice on the Policy.

National/ethnic origin of new recruits as at 30 June 2021

	2015	2016	2017	2018	2019	2020	2021
African	1	0	1	1	0	0	0
Asian	11	22	24	22	22	9	20
Latin American	4	4	1	6	4	0	2
Māori	2	1	2	7	1	6	9
Middle Eastern	0	5	4	1	5	1	1
New Zealand European	26	46	53	53	47	37	40
Other	2	1	0	2	1	2	4
Other European	14	22	23	23	23	16	13
Pacific Peoples	1	0	1	1	0	0	0
Total	61	101	109	116	103	71	89

Workforce profile as at 30 June 2021





Our research is creating the world's most sustainable production systems, including new varieties of blueberries.



Our Governance

Corporate governance

The Plant & Food Research Board, appointed by the Minister of Science & Innovation, sets the Institute's strategic direction and delegates responsibility for the management of the Institute to the Chief Executive.

Statement of Core Purpose

The Statement of Core Purpose (SCP) outlines the clear, explicit and enduring strategic role for Plant & Food Research as determined by the New Zealand Government. The SCP outlines the Institute's roles and responsibilities and how these will benefit New Zealand, and is used by the Crown to evaluate performance on a four-year rolling basis.

Plant & Food Research's SCP can be found online at plantandfood.com/scp

Statement of Corporate Intent

The Statement of Corporate Intent (SCI) outlines the Institute's five-year strategy, including the nature and scope of activities and performance targets. The SCI includes plans to contribute to the outcomes described in the SCP and outlines key performance indicators to support their delivery.

Plant & Food Research's SCI 2021/22 to 2023/24 can be found online at plantandfood.com/SCI2021

Legal obligations

Plant & Food Research is subject to (amongst others):

- Crown Research Institutes Act 1992
- Commerce Act 1986
- Crown Entities Act 2003
- Crown Entities Amendment Act 2013
- Health & Safety in Employment Act 1992
- Official Information Act 1982
- Public Audit Act 2001
- State Sector and Public Finance Reform Act 2012.

Board of Directors

The Board of Directors, appointed by the Minister of Science & Innovation according to the Crown Research Institutes Act, sets the Institute's strategic direction and delegates responsibility for the management of the Institute to the Chief Executive.

The Board acts under a Charter which formalises and sets out the manner in which the Board's powers and responsibilities will be exercised and discharged, adopting principles of good corporate governance and practices that accord with best practice and the application of laws in the jurisdictions in which the company operates. In line with best practice, the Board completes an annual Board performance evaluation.

The Board regularly reviews key policies across the Institute. "Deep-dive" reviews are also periodically undertaken, including most recently a review of the organisational risk framework and supporting risk registers.

For the 2020/21 year

Number of meetings held: 12

Meetings held at: Mt Albert, Tauranga, Matakana, Ruakura, Motueka and via Zoom.

- Nicola Shadbolt, Chair (11)
- Colin Dawson, Deputy Chair (12)
- Parmjot Bains (11)
- Dean Moana (11)
- Nadine Tunley (12)
- Wendy Venter (12)

(number in brackets indicates number of meetings attended during the 2020/21 year)

Profiles of the current Board of Directors can be found on page 64 or on the plantandfood.co.nz website. Remuneration details for the Directors can be found on page 71.

Schedule of major annual activities

- August – Annual Report
- October – Annual Risk Review (including Biosafety and Environmental Compliance)
- October – Insurance Renewal
- October – Strategy review and Science Advisory Panel (including review of Growing Futures Roadmaps)
- October – Annual General Meeting
- November – Full year reforecast
- December – Annual Health & Safety review
- March – Strategy review
- April – SCI and Business Plan.

Committees

There are currently two standing Committees operating under the direction of the Board Chair:

Audit & Risk Management Committee

Wendy Venter (Chair), Dean Moana, Nicola Shadbolt

Number of meetings in 2020/21: 6

The primary objective of the Audit & Risk Management Committee is to act as the main conduit with the company's auditors, to serve as an independent and objective party in reviewing financial information, auditing, accounting, compliance and financial reporting strategies and processes.

Appointments & Remuneration Committee

Colin Dawson (Chair), Parmjot Bains, Nicola Shadbolt

Nadine Tunley

Number of meetings in 2020/21: 3

The purpose of the Appointments & Remuneration Committee is to oversee the appointment, performance review and remuneration of the Chief Executive Officer and senior executives who report directly to the CEO.

Science Advisory Panel

The Board also receives advice from the Institute's external Science Advisory Panel.

The purpose of the Panel is to provide objective strategic advice to the Board to promote its decisions on research strategies, future science activities and development associated with achieving Plant & Food Research's Core Purpose.

Members of the Science Advisory Panel are:

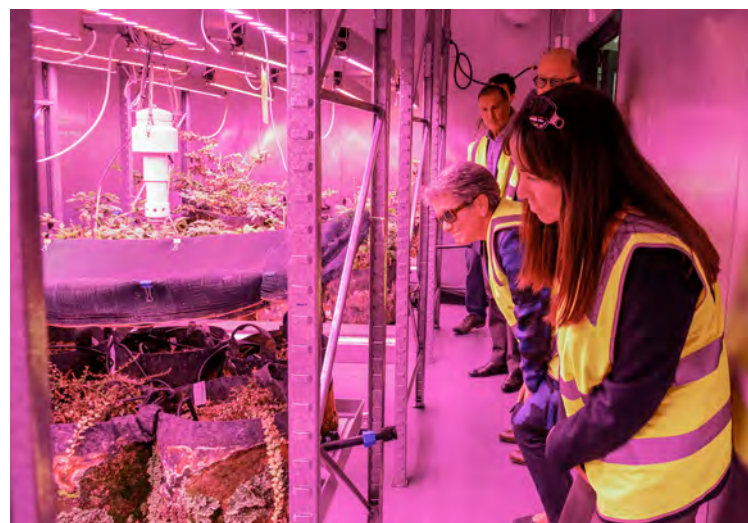
- Professor Gillian Dobbie (University of Auckland)
- Dr Ernst van den Ende (Wageningen University & Research Centre, The Netherlands)
- Professor Cathie Martin (John Innes Centre, UK)
- Professor Alastair Robertson (Australia).

Profiles of the Science Advisory Panel members can be found on page 65 or on the plantandfood.co.nz website.

Managing risk effectively

Plant & Food Research has an established framework for managing risk in an effective, efficient and consistent manner, to inform strategic and business planning processes, optimise allocation of resources and allow Plant & Food Research to effectively recognise, prioritise and respond to risks. The Risk Management Framework adopts processes consistent with those established in the ISO 31000:2009 Standard: Risk Management – Principles & Guidelines.

Plant & Food Research has a Business Continuity Plan (BCP) which acts as a framework for organisational



The Plant & Food Research Board toured the new research facilities at the Motueka Research Centre, including the controlled environment growing facility.

preparedness, emergency response and recovery after disruption by a significant natural or man-made incident. The BCP focuses on the response and recovery of critical assets and operations to mitigate the potential impact of an incident to the Institute's ability to deliver on its business and strategic plan and to protect Institute staff and the wider community. The BCP also includes a framework for site-specific Emergency Response Plans.

Code of Conduct & Ethics

Plant & Food Research's reputation is determined to a large degree by perceptions of the conduct and performance of its staff. The Code of Conduct & Ethics is intended to inform and guide the Institute's staff on the standards of conduct, decision-making and ethical behaviour that are important at Plant & Food Research.

The Code of Conduct & Ethics includes guidelines on:

- Acting with honesty and integrity
- Consistently demonstrating professionalism
- Respecting and acting within the law
- Maintaining confidentiality
- Avoiding conflicts of interest
- Being socially responsible.

Plant & Food Research operates its scientific research activities in accordance with national legislation, including ethics approvals for all human and animal studies (coordinated by the Institute's Biosafety Advisory Committee).

Board of Directors



Nicola Shadbolt, Chair

Nicola Shadbolt has worked in government, agribusiness, consultancy and academia and is a Professor of Farm and Agribusiness Management at Massey University. She serves on the Executive Committee and the Board of the International Food & Agribusiness Association and is a Climate Change Commissioner. She was an elected member of the Fonterra Board for nine years, was Chair of the Risk Committee and member of the Audit & Finance Committee, and served on the Board of the Manager of the Fonterra Shareholders' Fund. She is managing director with her husband of four farming and forestry equity partnerships based in the Manawatu. Nicola was made an officer of the New Zealand Order of Merit for services to agribusiness in 2018.



Parmjot Bains

Parmjot Bains has strategy and science commercialisation experience in New Zealand and globally. She has held roles in strategy with McKinsey and Company, biotechnology as the former CEO of Neuren Pharmaceuticals, in agribusiness with Fonterra and more recently in the pharmaceutical industry. She trained as a medical doctor in New Zealand and has a Masters degree from the University of Cambridge, UK.



Nadine Tunley

Nadine Tunley is currently the CEO of Horticulture New Zealand. In 2006 she founded her own business, Energie Produce Ltd, which was sold to Freshmax NZ Ltd in 2013. She is currently a director of Scales Corporation Ltd and Te Pitau Ltd, and was a member of the Primary Sector Council. She was previously Chair and director of NZ Apples & Pears Inc (formerly Pipfruit NZ Inc), and a director of Quality NZ Ltd, NZ Food Basket and BLinc Ltd. She was also Associate Director of Ngāi Tahu Seafood and Ngāi Tahu Holdings.



Colin Dawson, Deputy Chair

Formerly CEO of Otago Innovation, Colin has held directorships with a number of biotechnology and medical companies including NZX-listed companies BLIS Technologies and Pacific Edge. He currently chairs the Boards of Tiro Lifesciences, Upstream Medical Technologies and sits on the MARS Bioimaging Board.



Dean Moana

Dean Moana is a director of the New Zealand Food & Beverage Group Ltd and Ngāti Porou Holding Company Ltd, and a trustee of Te Runanganui o Ngāti Porou and Whangaokena ki Onepoto Kaitiaki Takutai Trust. He was previously Managing Director and Chair of Prepack Ltd, CEO of Prepared Foods Ltd and General Manager of Pacific Marine Farms Ltd.



Wendy Venter

Wendy Venter is a former partner at EY, deputy chief executive at the Ministry of Social Development and assistant auditor-general. Wendy chairs the Stats NZ Risk and Assurance Committee and sits on its Governance Advisory Board. She is a trustee of Wellington's Nikau Foundation and chairs the Parliamentary Counsel Office's Audit and Risk Committee.

For the 2020/21 year

Number of meetings: 12

Meetings held at: Mt Albert, Tauranga, Matakana, Ruakura, Motueka and via Zoom.

Science Advisory Panel

Our Science Advisory Panel is an important part of ensuring our science continues to have a focus on high quality, and is open to new international developments and ideas. The panel provides our Board with their insights on Plant & Food Research's science quality, strategy, and involvement in and uptake of new international developments.

Professor Gillian Dobbie

PhD
Department of Computer Science
University of Auckland, New Zealand



Gillian Dobbie is a Professor of Computer Science at the University of Auckland, and the Director of the Auckland ICT Graduate School. She is science lead on the Precision Driven Health joint research partnership and chairs the Science Advisory Group for the PlantTech Research Institute. Her main research interests are big data, stream data mining, machine learning, data management, and software engineering, and she has published more than 130 international peer reviewed papers. She convenes the Mathematical and Information Sciences panel for the Marsden Fund of the New Zealand Royal Society.

Dr Ernst van den Ende

PhD
Managing Director,
Plant Sciences Group (PSG),
Wageningen University, The Netherlands



Dr Ernst van den Ende has an extensive international background in agricultural science, particularly in management of urban green areas, plant diseases, plant pathogenic fungi and plant and crop protection. He has responsibility for the Plant Sciences Group at Wageningen, which conducts plant-related research and teaching programmes from the molecular through to the population level. Professor van den Ende has particular experience in the Wageningen University/PRI structure, which provides a relevant model for University/Research Institute collaboration and interaction. This is seen in the cluster of the Plant Sciences Group (PSG) which embodies applied research (Wageningen Plant Research) and fundamental research and education (Wageningen University).

Dr van den Ende brings to the panel particular understanding of research collaboration and development of interacting research structures. He also provides an important link with European organisations of interest to Plant & Food Research and an international perspective on sustainable plant production.

Professor Cathie Martin

PhD FRS
Group Leader, Department of
Cell and Developmental Biology,
John Innes Centre, UK



Professor Cathie Martin is an international leader in plant science, focusing on cellular specialisation and differentiation, particularly in relation to gene function. She has an extensive background in University and Research Institute research processes and programmes. Professor Martin, in addition to her position at the John Innes Centre, has a background in University visiting professorships and University relations. As former Editor-in-Chief of the world's leading plant science journal, *Plant Cell*, she has particular experience in identifying current and future international trends in plant science, and in evaluating science quality. Currently she is an Associate Editor for *Plant Physiology*. Her own research interests in cellular and metabolic regulation and functionality, particularly in the areas of nutritional properties of plants, are of particular importance to Plant & Food Research's research interests.

Professor Martin brings to the panel particular experience in leading international plant science, science evaluation, and an in-depth understanding of current and future trends and developments in both research technologies and science disciplines. She also strengthens Plant & Food Research's links with UK and European research organisations of interest.

Professor Alastair Robertson

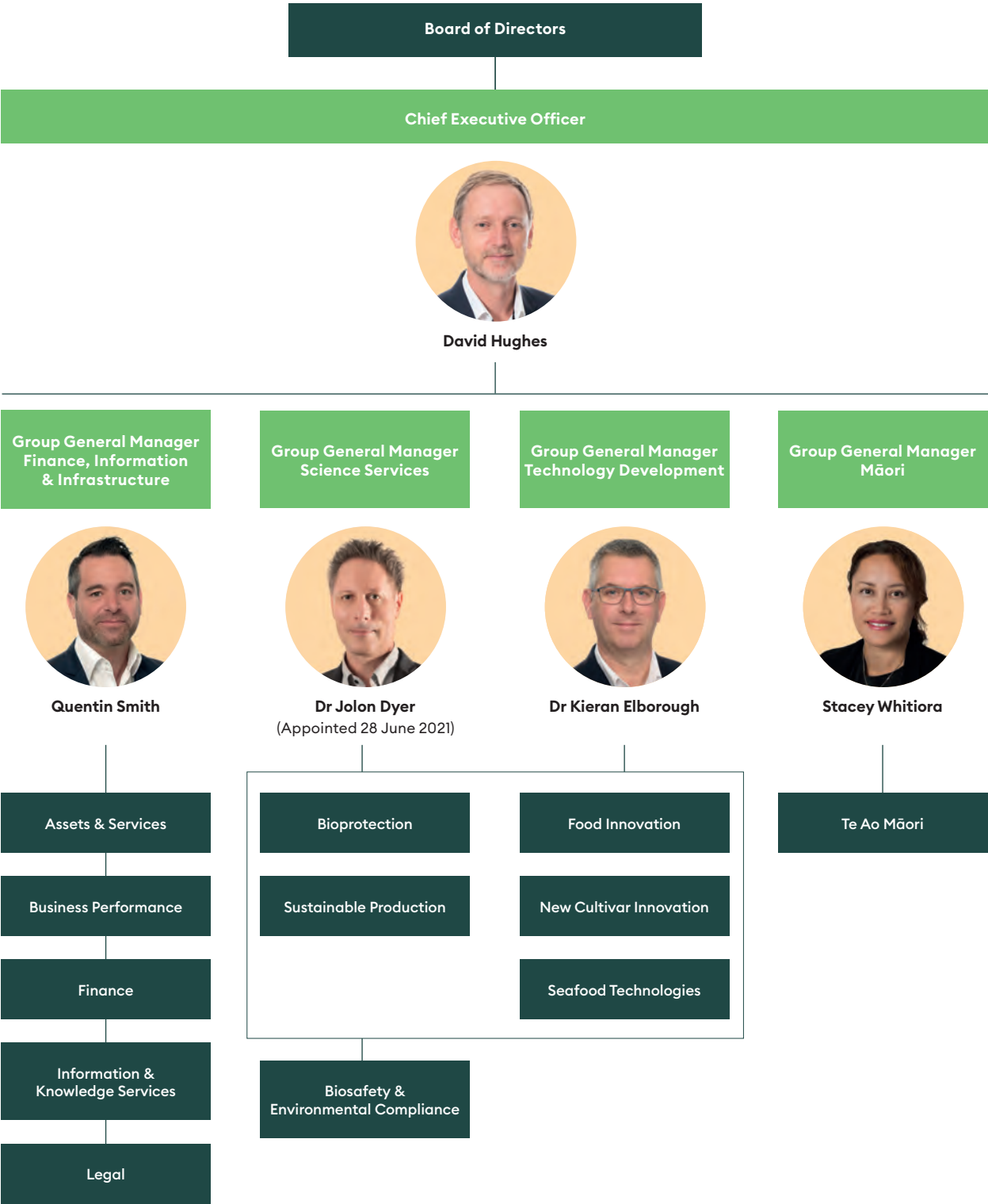
PhD FFSC CChem FIFST
Group Executive Food, Health & Life
Science Industries,
CSIRO, Australia



Professor Alastair Robertson is a leading international expert in food science. His career has involved research positions in both industry (in the UK) and in research institutes. These positions have included Director of the UK's Institute of Food Research (IFR), CEO of Food Science Australia, a joint venture between CSIRO and the Victorian Government, and CSIRO Executive Director (and subsequently Deputy Chief Executive), Science Strategy and Investment. He led the consolidation of the Australian National Research Flagships and oversaw the integration of the CSIRO Science Investment Process and Performance Management Framework as strong governance mechanisms to underpin CSIRO's delivery of impact from mission directed research. Professor Robertson currently holds an Honorary Professorship at the University of East Anglia (UK) and is a Research Professor at the University of Tasmania.

Professor Robertson brings to the panel wide international expertise in food science, and in developing and managing research structures based on science excellence and delivery. He also helps to consolidate Plant & Food Research's developing interaction with key Australian research centres and science initiatives.

Organisational chart



Group General Manager
People & Culture



Kath Clarke

Health & Safety

Human Resources

Organisational Development

Payroll

Group General Manager
Marketing & Innovation



Dr Gavin Ross

Business Development

Customer & Brand

Impact Evaluation

Intellectual Property

International Development

Partnerships & Growth

Plant Varieties

Chief Scientist



Professor Richard Newcomb

Our Senior Leadership Team oversees all aspects of Plant & Food Research and is accountable to the Board of Directors via the CEO. Collectively the team ensure the delivery of all research activities, finance and legal requirements, assets and services, human resources, commercial functions and science quality.

Our research in partnership with the kiwifruit industry is creating a smart green future for growers in the Bay of Plenty and across Aotearoa New Zealand.





Financial Statements

Financial performance

Plant & Food Research recorded strong financial results for the year ended 30 June 2021, as we recovered from the significant impact of COVID-19 disruption in the prior year. This recovery was anchored by ongoing strength in the agrifood industry as our customers responded to strong local and global demand for high-quality, healthy and safe foods.

Total revenue of \$184.1 million was up 8.9% on the prior year after recognition of COVID-19 recovery funding provided by the Government. Despite ongoing border closures continuing to have an impact on some international project work, overall commercial research revenue exceeded budget expectations. Furthermore, royalty revenues continued to grow strongly, finishing the year at \$58.0 million (vs \$51.6 million in the prior year).

Expenditure was tightly controlled in light of ongoing uncertainty in the operating environment. This, coupled with the strength in revenue performance, helped to deliver a profit before tax of \$20.9 million.

Plant & Food Research continues to benefit from a solid balance sheet, with year-end net assets of \$139.4 million. During the year, borrowings were repaid to strengthen financial resilience and headroom. This was a direct response to the ongoing COVID-19 uncertainty. Given the ongoing elevated risk profile associated with the current operating environment, we expect to maintain conservative borrowing settings over the short-medium term.

Over the last 12 months we have continued to make good progress with our investment programme to replace end-of-life buildings and equipment. Unfortunately the continuing impact of COVID-19 has provided some challenges in relation to the supply of certain materials, specialist equipment and componentry. We do not expect these challenges to abate materially over the next 12 months.

Subject to financial performance over the coming financial year meeting budgeted expectations, we intend to step-up investment in our people, science and infrastructure. In relation to infrastructure, we have a number of new strategic capital projects earmarked to commence in the 2021/22 financial year. This will see us continue to make meaningful progress as we deliver against our long-term capital plan.

\$205k (\$177k)
Annual Revenue
per FTE

\$184.1M (\$166.2M)
Total Revenue

\$37.4M (\$16.8M)
EBITDA

BRACKETS INDICATE TARGET

DIRECTORS' REPORT

THE DIRECTORS ARE PLEASED TO PRESENT THE FINANCIAL STATEMENTS OF THE NEW ZEALAND INSTITUTE FOR PLANT & FOOD RESEARCH LIMITED FOR THE YEAR ENDED 30 JUNE 2021.

	2021 Actual \$000	2021 Budget \$000	2020 Actual \$000
RESULTS OF GROUP OPERATIONS			
Revenue	184,074	166,232	168,956
Profit before taxation	20,866	847	9,966
Less taxation expense	6,066	437	118
Profit attributable to Owners	14,800	410	9,848

PRINCIPAL ACTIVITY OF THE GROUP

The Group's principal activity is to provide scientific research that benefits New Zealand, within the horticulture, arable, seafood and processed food industries; in accordance with the purpose and principles for the operation of Crown Research Institutes as set out in sections 4 and 5 of the Crown Research Institutes Act 1992. The Company is a company limited by shares and incorporated in accordance with the Companies Act 1993.

REVIEW OF OPERATIONS

A review of the operations accompany this report on page 13.

SHARE DEALINGS

The Directors have not, and are unable to, trade in shares of the Company as all shares of the Company are held by the Shareholding Ministers on behalf of the Crown. Accordingly the Board has received no notices of dealings in relevant interests in shares of the Company.

DIRECTORS' INSURANCE

Directors' and Officers' liability insurance was effected for the Directors and certain employees of the Company. The insurance is in respect of certain specified liabilities, not including criminal liability, incurred by a Director or employee in respect of any act or omission in his or her capacity as a Director or employee of the Company. The Company has indemnified Directors and certain employees of the Company for costs and proceedings and for liabilities incurred by the Director or employee in respect of any act or omission in his or her capacity as a Director or employee of the Company. The indemnity for liabilities incurred does not extend to criminal liability or liability for breach of a fiduciary duty owed to the Company.

AUDITORS

Troy Florence, with the assistance of PricewaterhouseCoopers, is the appointed auditor on behalf of the Auditor-General. The Auditor-General is the statutory auditor pursuant to section 14 of the Public Audit Act 2001 and section 21 of the Crown Research Institutes Act 1992.

SIGNIFICANT CHANGES

There were no significant changes to the business of the Company during the year.

DIRECTORS' REMUNERATION

During the year the following remuneration was paid or payable to Directors in accordance with the schedule approved by the Shareholding Ministers:

	Group \$
N Shadbolt	72,000
C Dawson	44,000
W Venter	37,000
P Bains	36,000
D Moana	36,000
N Tunley	36,000

REMUNERATION OF EMPLOYEES

The number of employees and ex-employees whose total remuneration, including benefits and severance payments, on an annualised basis, was in excess of \$100,000 in \$10,000 bands, is:

Remuneration bands in \$000	Number of employees	Remuneration bands in \$000	Number of employees
100 - 109	36	210 - 219	2
110 - 119	50	220 - 229	4
120 - 129	36	230 - 239	2
130 - 139	37	240 - 249	1
140 - 149	21	250 - 259	1
150 - 159	17	280 - 289	3
160 - 169	18	320 - 329	1
170 - 179	6	340 - 349	1
180 - 189	9	370 - 379	1
190 - 199	5	560 - 569*	1

* Includes the Chief Executive's remuneration

For and on behalf of the Board of Directors:



Nicola Shadbolt, Chair
27 August 2021

INDEPENDENT AUDITORS' REPORT

TO THE READERS OF THE NEW ZEALAND INSTITUTE
FOR PLANT & FOOD RESEARCH LIMITED'S FINANCIAL
STATEMENTS FOR THE YEAR ENDED 30 JUNE 2021

The Auditor-General is the auditor of The New Zealand Institute for Plant & Food Research Limited (the Group). The Auditor-General has appointed me, Troy Florence, using the staff and resources of PricewaterhouseCoopers, to carry out the audit of the financial statements of the Group on his behalf.

OPINION

We have audited the financial statements of the Group on pages 74 to 100, that comprise the balance sheet as at 30 June 2021, the statement of comprehensive income, statement of changes in equity and cash flow statement for the year ended on that date and the notes to the financial statements that include accounting policies and other explanatory information.

In our opinion, the financial statements of the Group:

- present fairly, in all material respects:
 - its financial position as at 30 June 2021; and
 - its financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand in accordance with New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS) and International Financial Reporting Standards (IFRS).

Our audit was completed on 27 August 2021. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities relating to the financial statements, we comment on other information, and we explain our independence.

BASIS FOR OUR OPINION

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

RESPONSIBILITIES OF THE BOARD OF DIRECTORS FOR THE FINANCIAL STATEMENTS

The Board of Directors is responsible on behalf of the Group for preparing financial statements that are fairly presented and that comply with generally accepted accounting practice in New Zealand.

The Board of Directors is responsible for such internal control as it determines is necessary to enable it to prepare financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board of Directors is responsible on behalf of the Group for assessing the Group's ability to continue as a going concern. The Board of Directors is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless the Board of Directors has to cease operations, or has no realistic alternative but to do so.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

RESPONSIBILITIES OF THE AUDITOR FOR THE AUDIT OF THE FINANCIAL STATEMENTS

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Reasonable assurance is a high level of assurance, but it is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the Group's statement of corporate intent

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- We obtain sufficient appropriate audit evidence regarding the financial statements of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the Group audit. We remain solely responsible for our audit opinion.

We communicate with the Board of Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

OTHER INFORMATION

The Board of Directors is responsible for the other information. The other information obtained at the date of our report is the Directors' Report on page 71, and the Performance Indicators and Statement of Responsibility on pages 101 to 102, but does not include the financial statements, and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

INDEPENDENCE

We are independent of the Group in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1: International Code of Ethics for Assurance Practitioners issued by the New Zealand Auditing and Assurance Standards Board.

Other than the audit, we have no relationship with, or interests in, the Group.



Troy Florence

PricewaterhouseCoopers
On behalf of the Auditor-General
Auckland, New Zealand



STATEMENT OF COMPREHENSIVE INCOME

for the year ended 30 June 2021

		GROUP	
		2021	2020
		Actual	Actual
			Unaudited
Note		\$000	\$000
PROFIT AND LOSS			
Revenue			
		43,184	43,081
		8,780	8,780
		14,820	13,138
		115,258	102,026
		2,032	1,931
		184,074	168,956
Less operating costs			
		96,077	98,845
		13,581	13,303
		1,746	1,196
		(110)	(2,917)
		50,683	47,119
		161,977	157,546
Profit before interest & taxation			
		22,097	11,410
		150	117
		(1,145)	(1,340)
		(236)	(221)
Profit before taxation			
		20,866	9,966
		6,066	118
Profit after taxation attributable to owners			
OTHER COMPREHENSIVE INCOME			
Items that may be reclassified subsequently to profit or loss:			
		(32)	39
		(48)	(2)
		(80)	37
Total comprehensive income attributable to owners			
		14,720	9,885

The accompanying notes form part of these financial statements.

STATEMENT OF CHANGES IN EQUITY

for the year ended 30 June 2021

ATTRIBUTABLE TO OWNERS OF THE GROUP

	Note	Share capital \$000	Retained earnings \$000	Foreign currency translation \$000	Cash flow hedge \$000	Total Equity \$000
Balance as at 01 July 2019		17,436	97,385	(38)	(8)	114,775
Changes in equity for						
Profit for the year			9,848			9,848
Other comprehensive income, net of taxes						
Currency translation				39		39
Revaluation of cash flow hedges	(18)				(2)	(2)
Balance as at 30 June 2020		17,436	107,233	1	(10)	124,660
Changes in equity for						
Profit for the year			14,800			14,800
Other comprehensive income, net of taxes						
Currency translation				(32)		(32)
Revaluation of cash flow hedges	(18)				(48)	(48)
Balance as at 30 June 2021		17,436	122,033	(31)	(58)	139,380

The accompanying notes form part of these financial statements.

BALANCE SHEET

as at 30 June 2021

	Note	GROUP		
		2021 Actual	2021 Budget Unaudited	2020 Actual Restated
		\$000	\$000	\$000
Current assets				
Cash and short-term deposits	(8)	9,812	3,289	2,888
Receivables and prepayments	(9)	43,329	40,317	38,170
Inventories		265	244	367
Total current assets		53,406	43,850	41,425
Current liabilities				
Accounts payable and accruals	(10)	25,683	23,402	21,650
Employee entitlements	(11)	12,380	11,653	11,917
Current borrowings	(8)	-	16,500	4,200
Lease liabilities	(13)	909	740	804
Taxation payable		1,588	(468)	2,575
Total current liabilities		40,560	51,827	41,146
Working capital		12,846	(7,977)	279
Non-current assets				
Property, plant and equipment	(12)	116,322	123,741	116,098
Right-of-use assets	(13)	19,537	14,319	16,093
Intangible assets	(14)	4,645	2,587	3,467
Investments - associates	(15)	2,815	3,598	2,589
Investments - other		49	50	49
Other assets		1,051	214	286
Deferred tax asset	(16)	3,394	73	3,289
Total non-current assets		147,813	144,582	141,871
Non-current liabilities				
Lease liabilities	(13)	19,294	14,139	15,615
Employee entitlements	(11)	1,985	1,804	1,875
Total non-current liabilities		21,279	15,943	17,490
NET ASSETS		139,380	120,662	124,660
Represented by:				
Equity				
Share capital	(17)	17,436	17,436	17,436
Retained earnings		122,033	103,198	107,233
Foreign currency translation reserve		(31)	(39)	1
Cash flow hedge reserve	(18)	(58)	67	(10)
TOTAL SHAREHOLDERS EQUITY		139,380	120,662	124,660

For and on behalf of the Board of Directors:



Nicola Shadbolt, Chair
27 August 2021



Wendy Venter, Director
27 August 2021

The accompanying notes form part of these financial statements.

CASH FLOW STATEMENT

for the year ended 30 June 2021

		GROUP	
	2021	2021	2020
	Actual	Budget	Actual
		Unaudited	
Note	\$000	\$000	\$000
Cash flows from/(applied to) operating activities			
Receipts from customers	179,553	162,630	173,864
Interest and dividends received	150	392	117
Payments to employees and suppliers	(145,438)	(149,506)	(145,093)
Interest paid	(1,076)	(259)	(1,245)
Tax paid	(6,310)	(1,385)	(774)
Net cash flows from operating activities	(20) 26,879	11,872	26,869
Cash flows from/(applied to) investing activities			
Sale of property, plant and equipment	141	-	3,974
Purchase of property, plant and equipment	(12,210)	(18,228)	(16,557)
Purchase of intangible assets	(2,292)	(1,600)	(1,840)
Purchase of investments	(463)	(1,900)	(1,051)
Net cash flows (applied to) investing activities	(14,824)	(21,728)	(15,474)
Cash flows from/(applied to) financing activities			
Proceeds from borrowings	-	10,700	-
Repayment of borrowings	(4,200)	-	(10,200)
Lease principal repayments	(906)	(900)	(778)
Net cash flows from/(applied to) financing activities	(5,106)	9,800	(10,978)
Net cash flow	6,949	(56)	417
Effect of foreign currency translation adjustment	(25)	-	15
Opening cash and cash equivalents	2,888	3,345	2,456
Closing cash and cash equivalents	(8) 9,812	3,289	2,888

The accompanying notes form part of these financial statements.

NOTES TO THE FINANCIAL STATEMENTS

for the year ended 30 June 2021

1. REPORTING ENTITIES

The New Zealand Institute for Plant & Food Research Limited (the “Company” or “Plant & Food Research”) and its subsidiaries (the “Group”) is a Crown Research Institute governed by the Crown Research Institute Act 1992 and is a limited liability company incorporated and domiciled in New Zealand. The whole of the share capital is held by Ministers of the Crown on behalf of the New Zealand Government. The Company’s registered office is 120 Mt Albert Road, Sandringham, Auckland 1025.

The Group is primarily involved in research services.

The Group is designated as a profit-oriented entity for financial reporting purposes.

These financial statements have been approved for issue by the Board of Directors on 27 August 2021.

2. BASIS OF PREPARATION

The financial statements are presented in New Zealand dollars (NZD), which is the Company’s functional and presentation currency. All financial information presented in New Zealand dollars has been rounded to the nearest thousand dollars (\$000).

The financial statements have been prepared under the historical cost convention, as modified by the revaluation of certain financial assets and financial liabilities (including derivative instruments) at fair value.

(A) Statement of Compliance

These financial statements have been prepared in accordance with the requirements of the Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993 and the Financial Reporting Act 2013.

The financial statements have also been prepared in accordance with New Zealand generally accepted accounting practice (NZ GAAP). They comply with New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS), and other Financial Reporting Standards, as appropriate for profit-oriented entities. They comply with International Financial Reporting Standards (IFRS).

The Group is a Tier 1 entity.

(B) Use of Estimates

The preparation of financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue and expenses. Although these estimates are based on management’s knowledge of current events and actions that may be undertaken in the future, actual results may ultimately differ from estimates. It also requires management to exercise its judgement in the process of applying the Group’s accounting policies.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to estimates are recognised in the period in which the estimate is revised and in any future periods affected. Use of estimates and assumptions is disclosed further in note 3(U).

COVID-19 Pandemic

Consistent with 2020, the Group’s operations were affected as a result of COVID-19 and lockdowns during the year. The Government provided funding under the COVID-19 Response and Recovery Fund of \$8.8M in both 2020 and 2021 to replace the revenue forecast to be impacted by COVID-19, refer Note 3 (B). There is no other material impact on the financial statements.

(C) New and Amended Standards and Interpretations Adopted by the Group

There are no new standards and amendments to standards that became effective in the current period financial statements.

(D) Standards and Interpretations Issued and not yet Adopted

There are no new standards or amendments to standards that have been issued but are not yet effective that have been early adopted by the Group.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

3. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The accounting policies set out below have been applied consistently to all periods presented in these financial statements.

(A) Basis of Consolidation

(i) Subsidiaries

The consolidated financial statements of the Group include the parent entity, Plant & Food Research, and its controlled entities. The Group controls an entity when the Group is exposed to, or has right to, variable returns from its involvement with the entity and has the ability to affect those returns through its power over the entity. This power exists where the Group controls the majority voting power on the governing body or where such policies have been irreversibly predetermined by the Group or where the determination of such policies is unable to materially impact upon the level of potential ownership benefits that arise from the activities of the subsidiary. The financial statements of subsidiaries are included in the consolidated financial statements from the date which the Group obtains control and until such time as the Group ceases to control the entity.

The Group measures the cost of a business combination as the aggregate of fair values, at the date of exchange, of assets given, liabilities incurred or assumed, in exchange for control of the subsidiary plus any costs directly attributable to the business combination.

Any excess of the cost of the business combination over the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities is recognised as goodwill. If the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities recognised exceeds the cost of the business combination, the difference will be recognised immediately in the Statement of Comprehensive Income.

The purchase method of accounting is used to prepare the consolidated financial statements of the Group. In preparing the consolidated financial statements, the effects of all transactions, balances and unrealised gains and losses on transactions between entities in the Group have been eliminated. The Group's investment in its subsidiaries are initially carried at cost in the Parent's financial statements subject to any write down arising from an annual impairment review.

(ii) Associates

Associates are those entities over which the Group has significant influence, but not control, of the financial and operating policies. Investments in associate companies have been accounted for using the equity method of accounting and are initially recognised at cost and the carrying amount is increased or decreased to recognise the Group's share of the surplus or deficit of the associate after the date of acquisition. The Group's share of the surplus or deficit of the associate is recognised in the Group's Statement of Comprehensive Income. Distributions received from an associate reduce the carrying amount of the investment.

If the Group's share of deficits of an associate equals or exceeds its interest in the associate, the Group discontinues recognising its share of further deficits. After the Group's interest is reduced to zero, additional deficits are provided for, and a liability is recognised, only to the extent that the Group has incurred legal or constructive obligations or made payments on behalf of the associate. If the associate subsequently reports surpluses, the Group will resume recognising its share of those surpluses only after its share of the surpluses equals the share of the deficits not recognised.

The Group's share in the associate's surplus or deficits resulting from unrealised gains on transactions between the Group and its associates is eliminated.

(B) Revenue

Revenue is recognised at the fair value of consideration received or receivable to the extent that it is probable, that economic benefits will flow to the Group. Revenue is shown net of GST, returns and discounts and after eliminating sales within the Group. The following specific recognition criteria must be met before revenue is recognised:

(i) Government grants

Strategic funding

Strategic funding from the Crown, was established 1 July 2011 and is recognised as a Government grant in accordance with NZ IAS 20. Government grants are recognised when there is reasonable assurance that the Group will comply with the conditions attaching to them and that the grant will be received. Government grants relating to costs are deferred and recognised in the profit or loss over the period necessary to match them with the costs that they are intended to compensate.

The primary condition is that the Group will deliver science research as specified in the strategic funding contract.

Strategic funding is recognised in the Statement of Comprehensive Income on a systematic basis in the year it is received.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

COVID-19 funding

The Government provided funding to the Group under the COVID-19 Response and Recovery Fund to replace revenue forecast to be impacted by COVID-19. This funding is recognised as a Government grant as this was a grant to provide financial support. Government grants are assistance provided by the Government in the form of transfers of resources to the Group in return for past or future compliance with certain conditions relating to the operating activities of the Group.

The primary condition is that the Group will maintain its national science capability and provision of services as specified in the funding contract.

COVID-19 funding is recognised in the Statement of Comprehensive Income in the year it is received.

(ii) Crown-funded research contracts

Crown-funded research contracts have one performance obligation and therefore the full transaction price is allocated to that one performance obligation. Crown-funded revenue is recognised over time using the input method. The input method is based on the Company's efforts to satisfy the performance obligation with revenue recognised by reference to the stage of completion of the performance obligation, assessed on the basis of the actual service provided as a proportion of the total services to be provided.

(iii) Commercial science research contracts

Sale of goods

Revenue from the sale of goods is recognised at the point in time when control of the goods has passed to the buyer and the amount of revenue can be reliably measured. Control is considered passed to the buyer at the time of delivery of the goods to the customer.

Sale of research services

Research services are provided on a fixed-price contract, with contract terms generally ranging from less than a year to five years.

Commercial research contracts have one performance obligation and therefore the full transaction price is allocated to that one performance obligation. Commercial science revenue is recognised over time using the input method. The input method is based on the Company's efforts to satisfy the performance obligation with revenue recognised by reference to the stage of completion of the performance obligation, assessed on the basis of the actual service provided as a proportion of the total services to be provided.

If circumstances arise that may change the extent of the progress toward completion, the estimates are revised. These revisions may result in increases or decreases in estimated revenues or costs and are reflected in income in the period in which the circumstances that give rise to the revision become known by management.

Royalties

Royalty revenue is recognised when the performance obligation to which the sales-based royalty has been allocated has been satisfied.

(iv) Other income

Rental income

Lease receipts under an operating lease are recognised as revenue on a straight-line basis over the lease term.

(v) Interest revenue

Interest revenue is recognised on a time-proportion basis using the effective interest method.

(C) Foreign Currency Translation

Foreign currency transactions are translated into New Zealand dollars using the exchange rates prevailing at the dates of the transactions, except when forward currency contracts have been taken out to cover short-term forward currency commitments. Where short-term forward currency contracts have been taken out, the transaction is translated at the rate contained in the contract. Foreign currency denominated monetary assets and liabilities are translated at the exchange rate prevailing at the period end. Foreign exchange gains or losses resulting from the settlement of such transactions and from the translation at balance date of foreign denominated monetary assets and liabilities are recognised in the Statement of Comprehensive Income, except when deferred in equity as qualifying cash flow hedges.

The results and balance sheets of all foreign operations that have a functional currency different from New Zealand dollars are translated into the presentation currency as follows:

The assets and liabilities of foreign controlled entities are translated by applying the rate ruling at balance date and revenue and expense items are translated at the average rate calculated for the period. The exchange differences arising on the re translation are taken directly to equity in the foreign currency translation reserve.

On consolidation, exchange differences arising from the translation of the net investment in foreign operations, and of borrowing and other currency instruments designated as hedges of such investments, are taken to shareholder's equity.

(D) Borrowing Costs

Borrowing costs are recognised as an expense in the period in which they are incurred.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

(E) Cash

Cash and cash equivalents includes cash in hand, deposits held at call with banks, other short-term highly liquid investments with maturities of three months or less from date of acquisition, and bank overdrafts. Bank overdrafts are shown within borrowings in current liabilities in the Balance Sheet.

(F) Trade and Other Receivables

Trade receivables are recognised initially at fair value, plus any transaction costs, and subsequently measured at amortised cost using the effective interest method, less any provision for loss allowance.

Collectibility of trade receivables is reviewed on an ongoing basis. Debts which are known to be uncollectible are written off when identified. A provision for loss allowance has been calculated using the simplified approach allowed under NZ IFRS 9 (see Note 9).

When a trade receivable is uncollectible, it is written off against the provision if it has been provided for or immediately recognised in the Statement of Comprehensive Income, within other operating expenses, if not. Any recoveries of trade receivables written off are credited against bad debts in the Statement of Comprehensive Income.

(i) Accrued income (contract asset)

Accrued income is the right to consideration in exchange for services transferred to the customer, conditioned on something other than the passage of time. Accrued income is recognised for the earned consideration that is conditional. The right to consideration is dependent on acceptance by the customer.

(G) Property, Plant and Equipment

The Group has four classes of property, plant and equipment:

- Land
- Buildings
- Plant and equipment
- Motor vehicles

Land is recorded at cost. All other property, plant and equipment is shown at cost less accumulated depreciation and any accumulated impairment losses, except for assets transferred from the Crown. Property, plant and equipment transferred from the Crown has been included in the accounts at values established by independent valuers which is the deemed cost. All subsequent expenditure has been initially recorded at cost.

Cost includes expenditures that is directly attributable to the acquisition of the asset. Subsequent costs are included in the asset's carrying amount only when it is probable that future economic benefits or service potential associated with the asset will flow to the Group and the cost of the item can be measured reliably. All other costs are recognised in the Statement of Comprehensive Income when the expense is incurred. Where an asset is acquired at no cost, or for a nominal cost, it is recognised at fair value as at the date of acquisition. The Group constructs some items of plant for use in research. These have been brought into the accounts at the cost of direct labour and materials plus an appropriate proportion of direct overheads.

Land transferred to the Group cannot be freely traded. Section 30 of the Crown Research Institutes Act 1992 requires that prior to sale sections 40-42 of the Public Works Act 1981 be complied with. These sections require that land offered for sale must be offered to the original owner of that land or their successors. An arbitration clause is included to establish fair values for such offers.

Gains and losses on disposals are determined by comparing the proceeds with the carrying amount of the asset. Gains and losses on disposal are included in the Statement of Comprehensive Income.

(i) Non-current Assets Held for Sale

Non-current assets are classified as assets held for sale when their carrying amount is to be recovered principally through a sale transaction and a sale is considered highly probable. They are stated at the lower of carrying amount and fair value less costs to sell if their carrying amount is to be recovered principally through a sale transaction rather than through continuing use and a sale is considered highly probable.

(H) Depreciation

Depreciation on assets, except land, is calculated using the straight-line method, at rates calculated to allocate the asset's cost, less estimated residual value, over its estimated useful life. Leasehold improvements are depreciated over the shorter of the unexpired period of the lease and the estimated useful life of improvements.

The useful lives of major asset classes of property, plant and equipment have been estimated as follows:

Buildings	10 - 100 years
Plant and equipment	3 - 10 years
Motor vehicles	3 - 10 years

The assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each financial year-end.

The assets' carrying value is written down immediately to its recoverable amount if the asset's carrying amount is greater than its estimated recoverable amount.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

(I) Intangible Assets

(i) Software

The cost of software, databases and related items, either acquired or internally generated, is recognised as an expense when incurred, except for:

The cost of software, databases and related items, either acquired or internally generated, which are unique and controlled by the Group, and that will probably generate measurable economic benefits exceeding costs beyond one year is capitalised as intangible assets.

Costs associated with maintaining computer software are recognised as an expense when incurred.

The carrying value of software is amortised on a straight-line basis over its useful life. Amortisation begins when the asset is available for use and ceases at the date that the asset is derecognised. The amortisation charge for each period is recognised in the Statement of Comprehensive Income.

The useful lives and associated amortisation rates of major classes of intangible assets have been estimated as follows:

Software 3 - 5 years

(ii) Trademarks and licenses

The cost of acquired trademarks and licenses are capitalised as intangible assets where they will probably generate measurable economic benefits exceeding costs beyond one year. Trademarks and licenses have a finite useful life and are carried at cost less accumulated amortisation.

Amortisation is calculated using the straight-line method to allocate the cost over their estimated useful lives, which is between 10 and 15 years.

(iii) Research and development

Research and development is the business of the Company. Most work is performed under contract for others, and in most cases intellectual property rights are retained. All research and development costs are expensed in the period they are incurred.

When a project reaches the stage where it will probably generate future measurable economic benefits exceeding development cost, development cost is recognised as an intangible asset. The asset is amortised from the commencement of commercial production of the product to which it relates, on a straight-line basis, over the period of expected benefit.

(J) Financial Assets

(i) Classification

The Group classifies its financial assets in the following measurement categories: those to be measured at amortised cost and those to be measured subsequently at fair value (either through other comprehensive income, or through profit or loss). The classification depends on the group's business model for managing the financial assets and the contractual terms of the cash flow.

For assets measured at fair value, gains and losses will be either recorded in profit or loss or other comprehensive income. For investments in debt instruments, this will depend on the business model in which the investment is held. For investments in equity instruments, this will depend on whether the Group has made an irrevocable election at the time of initial recognition to account for the equity investment at fair value through other comprehensive income.

The Group reclassifies debt investments when and only when its business model for managing those assets changes.

(ii) Measurement

At initial recognition, the Group measures financial assets at fair value plus, in the case of a financial asset not at fair value through profit or loss, transaction costs that are directly attributable to the acquisition of the financial asset. Transaction costs of financial assets carried at fair value through profit or loss are expensed in profit or loss.

(iii) Financial assets at fair value through profit or loss

This category has two sub-categories: financial assets held for trading, and those designated at fair value through profit or loss at inception. A financial asset is classified in this category if acquired principally for the purpose of selling in the short term or if so designated by management. Derivatives are also categorised as held for trading unless they are designated as hedges. Assets in this category are classified as current assets if they are either held for trading or are expected to be realised within 12 months of the balance sheet date. After initial recognition they are measured at their fair values. Gains or losses on remeasurement are recognised in the Statement of Comprehensive Income.

Financial assets in this category include derivatives, see note 3 (R).

(iv) Financial assets at amortised cost

The Group classifies its financial assets at amortised cost only if both of the following criteria are met:

- the asset is held to collect the contractual cash flows, and
- the contractual terms give rise to cash flows that are solely payments of principal and interest.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

(K) Leased Assets

The Group leases various land, offices and research facilities. The terms of the leases vary, with land and buildings leases ranging from 2 – 28 years.

Contracts may contain both lease and non-lease components. Lease terms are negotiated on an individual basis and contain a wide range of different terms and conditions. The lease agreements do not impose any covenants other than the security interest in the leased assets that are held by the lessor. Leased assets may not be used as security for borrowing purposes.

Assets and liabilities arising from a lease are initially measured on a present value basis. Right-of-use assets are depreciated on a straight line-basis over the period of the lease.

Lease payments include any renewal periods that are likely to be exercised. The lease payments are discounted using the Group's incremental borrowing rate which ranges from 3% to 6% and is the rate the Group would borrow the funds required to purchase an asset of a similar value to the right-of-use asset in a similar economic environment with similar terms, security and conditions.

The Group is exposed to potential future increases in land and building lease payments based on contractual market rent reviews that are not included in the lease liability until the rent review takes effect.

Lease payments are allocated between principal and lease interest. The lease interest is charged to the profit and loss over the term of the lease.

Payments associated with short-term leases of 12 months or less are recognised as an expense in the profit or loss.

(L) Impairment of Financial Assets

The Group assesses on a forward looking basis the expected credit losses associated with its assets carried at amortised cost and fair value through other comprehensive income. The impairment methodology applied depends on whether there has been a significant increase in credit risk. Note W details how the Group determines whether there has been a significant increase in credit risk.

For trade receivables only, the Group applies the simplified approach permitted by NZ IFRS 9, which requires expected lifetime losses to be recognised from initial recognition of the receivables.

(M) Trade Payables

Trade payables are initially measured at fair value and subsequently measured at amortised cost using the effective interest method.

(i) Revenue in advance (contract liability)

Revenue in advance is the obligation to transfer services to a customer for which the Group has received consideration from the customer. Revenue in advance is recognised as revenue when the Group performs under the contract.

(N) Provisions

Provisions are recognised when the Group has a present obligation (either legal or constructive), as a result of a past event, it is probable that an outflow of economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation. Provisions are not recognised for future operating losses.

Provisions are measured at the present value of management's best estimate of the expenditure required to settle the present obligation at the balance sheet date, the discount rate used to determine the present value reflects current market assessments of the time value of money and the risks specific to the liability. The increase in the provision due to the passage of time is recognised as an interest expense.

(O) Employee Benefits

(i) Wages and salaries, annual leave, sick leave and other benefits

Provision is made for employee benefits accumulated as a result of employees rendering services up to balance date including related oncosts.

The benefits include wages and salaries, annual leave, sick leave, incentives and other benefits. The provision for employee benefits is measured at the remuneration rates expected to be paid when the liability is settled.

The Group recognises a liability for sick leave to the extent that absences in the coming year are expected to be greater than the sick leave entitlements earned in the coming year. The amount is calculated based on the unused sick leave entitlement that can be carried forward at balance date, to the extent that the Group anticipates it will be used by staff to cover those future absences.

The Group recognises a liability and an expense for bonuses where contractually obliged or where there is a past practice that has created a constructive obligation.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

(ii) Long service leave and retirement leave

Service leave and retirement leave entitlements are calculated based on the employee's entitlement and their current pay rate. The liability for long service leave is recognised in the provision for employee benefits and measured as the present value of expected future payments to be made in respect of services provided by employees up to the reporting date. Consideration is given to expected future wage and salary levels, experience of employee departures and periods of service.

Long term benefits expected to be settled within 12 months are classified as employee entitlements under current liabilities.

(iii) Pension and post retirement benefits

The Group operates a defined contribution superannuation plan. A defined contribution plan is a pension plan under which the Group pays fixed contributions to a separate entity. The Group has no legal or constructive obligations to pay further contributions if the fund does not hold sufficient assets to pay all employees the benefits relating to employee service in the current and prior periods.

The Group's contributions made to defined contribution superannuation plans are recognised as an expense in the Statement of Comprehensive Income when they are due.

(P) Income Tax

(i) Current tax

Income tax expense comprises both current tax and deferred tax, and is calculated using tax rates that have been enacted or substantially enacted by balance date. Current tax and deferred tax are charged or credited to the Statement of Comprehensive Income, except when they relate to items charged or credited directly to equity, in which case the tax is dealt with in equity. Current tax is the amount of income tax payable based on the taxable profit for the current year, plus any adjustments to income tax payable in respect of prior years.

(ii) Deferred tax

Deferred tax is the amount of income tax payable or recoverable in future periods in respect of temporary differences calculated using the liability method and unused tax losses. Deferred tax is not accounted for if it arises from initial recognition of goodwill or from initial recognition of an asset or liability in a transaction, other than a business combination, that at the time of the transaction affects neither accounting nor taxable profit or loss.

Deferred tax is recognised if it arises from investments in subsidiaries and associates, and interests in joint ventures, except where the company can control the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future.

Deferred tax is measured using the tax rates (and laws) that have been enacted or substantively enacted by the balance sheet date and are expected to apply when the related deferred income tax asset is realised or the deferred income tax liability is settled. A deferred tax asset is recognised to the extent that it is probable that future taxable profits will be available against which the temporary differences can be utilised. Deferred tax assets are reviewed at each reporting date and are reduced to the extent that it is no longer probable that the related tax benefit will be realised.

(Q) Goods & Services Tax (GST)

The Statement of Comprehensive Income has been prepared so that all components are stated exclusive of GST. All items in the Balance Sheet are stated net of GST, with the exception of receivables and payables which include GST invoiced. Where GST is not recoverable as input tax then it is recognised as part of the related asset or expense. The net amount of GST recoverable from, or payable to, the Inland Revenue Department is included as part of receivables or payables in the Balance Sheet.

The net GST paid to, or received from the IRD, including the GST relating to investing and financing activities, is classified as an operating cash flow in the Cash Flow Statement.

Commitments and contingencies are disclosed exclusive of GST.

(R) Derivative Financial Instruments

Derivatives are initially recognised at fair value on the date a derivative contract is entered into and are subsequently re-measured to their fair value at the end of each reporting period. The accounting for subsequent changes in fair value depends on whether the derivative is designated as a hedging instrument, and if so, the nature of the item being hedged and the type of hedge relationship designated.

The Group designates their derivatives as hedges of foreign exchange risk associated with the cash flows of highly probably forecast transactions (cash flow hedges).

The Group documents at the inception of the hedging transaction the economic relationship between hedging instruments and hedged items including whether the hedging instrument is expected to offset changes in cash flows of hedged items. The Group documents its risk management objective and strategy for undertaking various hedge transactions at the inception of each hedge relationship.

(S) Borrowings

Borrowings are initially recognised at their fair value net of transaction costs. After initial recognition all borrowings are measured at amortised cost using the effective interest method.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

(T) Budget Figures

The budget figures are derived from the Statement of Corporate Intent as approved by the Board, and the Shareholder, at the beginning of the financial year. The budget figures have been prepared in accordance with NZ IFRS, using accounting policies that are consistent with those adopted by the Group for the preparation of these financial statements. The budget figures are unaudited.

(U) Critical Accounting Estimates and Assumptions

In preparing these financial statements the Group has made estimates and assumptions concerning the future. These estimates and assumptions may differ from the subsequent actual results. Estimates and assumptions are continually evaluated and are based on historical experience and other factors, including expectation of future events that are believed to be reasonable under the circumstances. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

(i) Revenue recognition

In determining the revenue to be recognised from a contract to provide services judgement is required in respect of assessing the percentage of completion of the project. In making this judgement the actual service provided as a proportion of the total services to be provided is reviewed.

If circumstances arise that may change the extent of the progress the estimates are revised.

(ii) Impairment provisions

The impairment provisions for financial assets disclosed in Note 9 are based on assumptions about risk of default and expected loss rates. The Company uses judgement in making these assumptions and selecting the inputs to the impairment calculation, based on the Company's past history, existing market conditions as well as forward looking estimates at the end of each reporting period.

(iii) Leased assets

The valuation of right-of-use assets and lease liabilities requires judgement to determine the incremental borrowing rate and the likelihood of exercising any rights of renewal to extend the lease term. The Group has assumed that all rights of renewal will be exercised consistent with the Group's usual practice.

(iv) Retirement and long service leave

The present value of the retirement and long service leave obligations depend on a number of factors that are determined on an actuarial basis using a number of assumptions. Two key assumptions used in calculating this liability include the discount rate and the salary inflation factor. Any changes in these assumptions will impact on the carrying amount of the liability.

In determining the appropriate discount rate the Company considered the interest rates on NZ government bonds which have terms to maturity that match, as closely as possible, the estimated future cash outflows. The salary inflation factor has been determined after considering historical salary inflation patterns. A weighted average discount rate of 1.7% and a salary inflation factor of 2.5% were used.

If the discount rate were to differ by 1% from the Company's estimates, with all other factors held constant, the carrying amount of the liability would be an estimated \$64,000 higher / lower.

If the salary inflation factor were to differ by 1% from the Company's estimates, with all other factors held constant, the carrying amount of the liability would be an estimated \$19,000 higher / lower.

The carrying amount of employee entitlements are disclosed in the Balance Sheet.

(v) Holiday pay remediation provision

The Company has provisioned for holiday pay remediation payments this year. The Company used judgement in determining the level of provisioning made based on sample variances, average payments made by other companies and then selecting the mid-point of the range calculated.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

Note	GROUP	
	2021 \$'000	2020 \$'000
4. COMMERCIAL SCIENCE RESEARCH CONTRACTS		
Royalties	58,009	51,648
Other commercial science research contracts	57,249	50,378
Total commercial science research contracts	115,258	102,026

As a result of COVID-19 lockdown, and on-going travel restrictions, our commercial science research was negatively impacted in 2020.

The table below details how much of the revenue recognised in the current report period relates to carried-forward revenue-in-advance.

Revenue recognised that was included in revenue-in-advance at the beginning of the period		
Commercial science research contracts	8,614	6,172

4A. OPERATING COSTS

Includes:

Auditors' remuneration		
Audit fees for financial statement audit	138	134
Severance payments*	225	132
Directors fees	261	242
Employer contributions to defined contribution plans	1,669	1,672
Unrealised foreign exchange (gains)	(15)	(235)

* Payments were made to 4 employees in 2021 (2020: 4 employees).

5. DEPRECIATION AND AMORTISATION

Depreciation		
Buildings	3,732	3,806
Plant and equipment	8,187	7,880
Motor vehicles	416	512
Total depreciation on property, plant and equipment	(12) 12,335	12,198
Total depreciation on right-of-use assets	(13) 1,246	1,105
Amortisation		
Software and databases	1,746	1,196
Patents, trademarks and licences	-	-
Total amortisation of intangible assets	(14) 1,746	1,196

6. OTHER OPERATING EXPENSES

Other operating expenses		
Materials	5,653	5,086
Research & services contracts	18,868	14,257
Property expenses	7,578	7,656
Travel	2,252	4,656
Other general operating costs	16,332	15,464
Total other operating expenses	50,683	47,119

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

	Note	GROUP	
		2021 \$'000	2020 \$'000
7. TAXATION			
Profit before taxation		20,866	9,966
Prima facie taxation @ 28%		5,842	2,791
Plus/(less) taxation effect:			
Non-assessable income		(7)	(845)
Non-deductible expenditure		284	119
Prior period adjustment		80	37
Imputation credits on dividends received		(49)	(39)
Reintroduction of building depreciation*		-	(1,919)
Utilisation of tax losses		(84)	(26)
		6,066	118
The taxation charge is represented by:			
Current taxation		6,171	3,348
Deferred tax benefit	(16)	(105)	(3,230)
		6,066	118

The Company is not required to maintain an Imputation Credit Account pursuant to section OB1(2)(d) of the Income Tax Act 2007.

* This is a result of the COVID-19 Response (Taxation and Social Assistance Urgent Measures) Bill enacted on 25 March 2020 which impacted the deferred tax as shown in Note 16.

8. CASH AND BORROWINGS

Cash on hand and at bank	9,812	2,888
Short-term deposits	-	-
Cash and short-term deposits	9,812	2,888

The carrying value of short-term deposits with maturity dates of three months or less approximates their fair value.

Current portion of borrowings	-	4,200
Borrowings	-	4,200

The Group has the following borrowing facilities at 30 June 2021:

	Expiry	Facility	Drawdown
Multi option credit facility No. 1	30 September 2022	6,000	-
Multi option credit facility No. 2	30 June 2025	14,000	-

The borrowings are secured by a first ranking general security agreement over the Group's assets and subject to two financial covenants. The general security agreement means that the Group may not grant a security interest greater than 5% of total tangible assets to another party or dispose of assets greater than \$1,000,000 without the consent of the bank.

The Group is required to ensure that the following financial ratios are met:
 (i) Shareholder funds of not less than 50% of adjusted tangible assets; and
 (ii) Earnings for the year not less than 3.00 times its consolidated funding costs.

The Group complied with these ratios during the year ended 30 June 2021 (2020: complied).

As at 30 June 2021 there were no facilities drawn down.

As at 30 June 2020, the total facilities drawn of \$4.2M were classified as current as they were payable on demand or were on call. The interest rate for borrowings was 2.0% for 2021 (2020: 2.1%).

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

9. RECEIVABLES AND PREPAYMENTS

Trade receivables

Loss allowance

Accrued income

Prepayments and other receivables

GROUP	
2021	2020
\$000	\$000
30,646	24,807
(353)	(376)
30,293	24,431
10,222	10,768
2,814	2,971
43,329	38,170

The carrying value of receivables approximates their fair value. The carrying amount of receivables that would otherwise be past due, but not impaired, whose terms have been renegotiated is \$1,089,000 (2020: \$2,035,000).

The Group applies the NZ IFRS 9 simplified approach to providing for expected credit losses, which uses the lifetime expected loss allowance for all trade receivables.

To measure the expected credit losses trade receivables have been grouped based on days past due. The expected loss rates are based on our historical credit losses since 2010, adjusted for any significant known amounts that are not receivable. Forward looking information, and the impact of COVID-19, has also been incorporated as appropriate. The impact of COVID-19 on expected credit losses during the year is not considered to be material.

On this basis, the loss allowance at 30 June 2021 is as follows:

	Expected loss rate	Gross carrying amount	Loss allowance provision
Not past due	0.43%	29,330	(126)
Past due 1 - 30 days	0.75%	789	(6)
Past due 31 - 60 days	1.50%	227	(3)
Past due 61 - 90 days	5.00%	-	-
Past due > 91 days	72.6%	300	(218)
Total		30,646	(353)

Movements in the loss allowance provision for receivables are as follows:

Balance at 01 July
Additional provisions during the year
Receivables written-off during the year

Balance at end of year

GROUP	
2021	2020
\$000	\$000
(376)	(286)
23	(100)
-	10
(353)	(376)

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

	GROUP	
	2021	2020
	\$000	\$000
10. ACCOUNTS PAYABLE AND ACCRUALS		
Trade payables	9,955	7,845
Other payables and accruals	4,088	4,582
Revenue in advance	11,640	9,223
	25,683	21,650

Accounts payable and accruals are non-interest bearing and are normally settled on 30-day terms, therefore the carrying value of accounts payable and accruals approximates their fair value.

11. EMPLOYEE ENTITLEMENTS

Annual leave	6,719	6,812
Service leave	1,383	1,231
Retirement leave	3,337	3,375
Other leave and accruals	2,926	2,374
Total employee entitlements	14,365	13,792
Comprising:		
Current	12,380	11,917
Non-current	1,985	1,875
	14,365	13,792

The travel restrictions imposed by COVID-19 impacted on the amount of leave taken during March to June 2020. This resulted in higher annual leave entitlements owing at 30 June 2020 and 2021.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

12. PROPERTY, PLANT AND EQUIPMENT

	GROUP				
	Land	Buildings	Plant and Equipment	Motor Vehicles	Total
	\$000	\$000	\$000	\$000	\$000
Cost					
Opening balance 01 July 19	8,262	106,246	133,371	6,344	254,223
Additions	5,593	1,327	8,268	519	15,707
Disposals	(92)	(28)	(399)	(381)	(900)
Transfers	-	79	(1,352)	-	(1,273)
Foreign exchange movement	-	-	1	-	1
Closing balance 30 June 20	13,763	107,624	139,889	6,482	267,758
Accumulated depreciation					
Opening balance 01 July 19	-	36,496	99,321	4,456	140,273
Depreciation	-	3,806	7,880	512	12,198
Disposals	-	(79)	(399)	(333)	(811)
Transfers	-	-	-	-	-
Closing balance 30 June 20	-	40,223	106,802	4,635	151,660
Net book value	13,763	67,401	33,087	1,847	116,098

	GROUP				
	Land	Buildings	Plant and Equipment	Motor Vehicles	Total
	\$000	\$000	\$000	\$000	\$000
Cost					
Opening balance 01 July 20	13,763	107,624	139,889	6,482	267,758
Additions	-	1,796	10,283	1,144	13,223
Disposals	-	-	(336)	(381)	(717)
Transfers	-	211	(843)	-	(632)
Foreign exchange movement	-	-	-	-	-
Closing balance 30 June 21	13,763	109,631	148,993	7,245	279,632
Accumulated depreciation					
Opening balance 01 July 20	-	40,223	106,802	4,635	151,660
Depreciation	-	3,732	8,187	416	12,335
Disposals	-	-	(318)	(367)	(685)
Transfers	-	-	-	-	-
Closing balance 30 June 21	-	43,955	114,671	4,684	163,310
Net book value	13,763	65,676	34,322	2,561	116,322

The Company holds numerous germplasm collections of horticultural material for research purposes. Due to the nature of the collections their value can not be measured reliably for financial purposes, however they have a fundamental importance to the Company's research.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

13. LEASES

The Group reports all leases on the balance sheet where it has the right to obtain substantially all of the economic benefits from the use of the asset throughout the period, with the exception of low value leases and leases with a duration of less than 12 months.

The Group leases relate to land and buildings. Right-of-use assets are measured at cost, comprising the amount of the initial measurement of the lease liability. These assets are subsequently depreciated using the straight-line method from the commencement date to the end of the lease term. Lease liabilities represent the net present value of fixed payments.

The following table details leases where the Group is a lessee:

	GROUP	
	2021 \$'000	2020 \$'000
Right-of-use lease assets		
Opening balance	16,093	14,100
Additions and modifications	4,690	3,098
Depreciation	(1,246)	(1,105)
Closing balance	19,537	16,093
Represented by:		
Cost	21,888	17,198
Accumulated depreciation	(2,351)	(1,105)
	19,537	16,093
Lease liabilities		
Current	909	804
Non-current	19,294	15,615
	20,203	16,419
The movements for the year are as follows:		
Opening balance	16,419	14,100
Additions and modifications	4,690	3,098
Lease payments	(1,808)	(1,600)
Interest of leases	902	821
Closing balance	20,203	16,419
Amounts payable under leases		
Less than one year	909	804
Two to five years	3,519	2,865
More than five years	15,775	12,750
Total	20,203	16,419

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

14. INTANGIBLE ASSETS

	GROUP			
	Software, Databases \$000	Patents, Trademarks \$000	Goodwill \$000	Total \$000
Cost				
Opening balance 01 July 19	11,829	467	19	12,315
Additions	1,840	-	-	1,840
Disposals	-	-	-	-
Transfers	1,273	-	-	1,273
Closing balance 30 June 20	14,942	467	19	15,428
Accumulated amortisation				
Opening balance 01 July 19	10,279	467	19	10,765
Amortisation	1,196	-	-	1,196
Disposals	-	-	-	-
Transfers	-	-	-	-
Closing balance 30 June 20	11,475	467	19	11,961
Net book value	3,467	-	-	3,467

	GROUP			
	Software, Databases \$000	Patents, Trademarks \$000	Goodwill \$000	Total \$000
Cost				
Opening balance 01 July 20	14,942	467	19	15,428
Additions	2,292	-	-	2,292
Disposals	-	-	-	-
Transfers	632	-	-	632
Closing balance 30 June 21	17,866	467	19	18,352
Accumulated amortisation				
Opening balance 01 July 20	11,475	467	19	11,961
Amortisation	1,746	-	-	1,746
Disposals	-	-	-	-
Transfers	-	-	-	-
Closing balance 30 June 21	13,221	467	19	13,707
Net book value	4,645	-	-	4,645

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

15. INVESTMENTS

(i) Subsidiaries	Principal Activity	Balance Date	Interest Held %
CropSeed Limited	Seed growing services	30 June	100
2before Performance Nutrition Limited	Sports performance nutrition online retailer	30 June	100
Berryfruit Holdings Limited	IP holding company	30 June	100
Plant & Food Research (USA) Corporation	Marketing and consultancy services in the USA	30 June	100
Plant & Food Research Australia Pty Limited	Science, marketing and consultancy services in Australia	30 June	100

Plant & Food Research Australia Pty Limited is incorporated in Australia. Plant & Food Research (USA) Corporation is incorporated in the USA. All other subsidiaries are incorporated in New Zealand.

(ii) Associates

The Group's share of (loss) in its associated companies and joint ventures for the year was (\$236,000) (2020: \$221,000).

30 June 2021	Principal Activity	Interest Held	Total Assets	Total Liabilities	Revenue	Profit/(Loss)
Pacific Berries LLC	Developing & commercialising IP	50.0%	1,073	93	955	(28)
Forage Innovations Limited	Developing & commercialising IP	49.0%	1,438	102	2,185	342
Biopolymer Network Limited	Developing & commercialising IP	42.7%	1,121	53	40	(423)
Prevar Limited	Developing & commercialising IP	29.0%	2,144	1,440	3,901	(635)

30 June 2020

Pacific Berries LLC	Developing & commercialising IP	50.0%	1,130	24	531	223
Forage Innovations Limited	Developing & commercialising IP	49.0%	1,649	656	1,708	322
Biopolymer Network Limited	Developing & commercialising IP	42.7%	603	37	531	(273)
Prevar Limited	Developing & commercialising IP	29.0%	5,806	943	3,544	(1,175)

	GROUP	
	2021 \$'000	2020 \$'000
Pacific Berries LLC	505	544
Forage Innovations Limited	633	466
Biopolymer Network Limited	466	184
Prevar Limited	1,209	1,393
Other associates & joint ventures	2	2
Total associate and joint venture investments	2,815	2,589

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

16. DEFERRED TAX ASSET/(LIABILITY)

	Property, plant equipment \$000	Investments- associates \$000	Derivative financial instruments \$000	Employee entitlements \$000	Other provisions \$000	Tax losses \$000	Total \$000
GROUP							
Balance at 30 June 2019	(1,742)	(4)	(2)	2,820	(1,013)	-	59
Charged to statement of comprehensive income	2,888	94	(1)	319	(70)	-	3,230
Balance at 30 June 2020	1,146	90	(3)	3,139	(1,083)	-	3,289
Charged to statement of comprehensive income	246	55	(13)	(156)	(46)	-	105
Balance at 30 June 2021	1,411	145	(16)	2,983	(1,129)	-	3,394

17. SHARE CAPITAL & RESERVES

Ordinary shares (000's)

On issue opening balance

Issued for cash

On issue at closing balance 30 June

GROUP	
2021 \$000	2020 \$000
17,436	17,436
-	-
17,436	17,436

All issued shares are fully paid and have no par value.

The holders of ordinary shares are entitled to receive dividends as declared from time to time and are entitled to one vote per share at meetings of the Company.

All shares rank equally with regard to the Company's residual assets.

18. CASH FLOW HEDGE RESERVE

Opening balance at 01 July

Transferred to cost of sales

Revaluations

Closing balance at 30 June

(10)	(8)
-	-
(48)	(2)
(58)	(10)

The hedge reserve is used to record fair value gains or losses on foreign exchange forward contracts that qualify as cash flow hedges.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

19. COMMITMENTS

The following amounts have been committed to by the Group, but are not recognised in the financial statements:

a) Capital commitments

Property, plant and equipment

b) Operating commitments (excluding leases recognised on the balance sheet)

c) Operating lease income

Lease income under non-cancellable operating leases are as follows:

Not later than one year

Later than one year and not later than five years

Later than five years

GROUP

2021 2020
\$000 \$000

4,474	3,474
220	141
534	151
674	145
-	-
1,208	296

The Group received rental income of \$685,000 during the year (2020: \$822,000). Rental income is included within Other income in the Statement of Comprehensive Income.

20. RECONCILIATION OF PROFIT AFTER TAX WITH CASH FLOW FROM OPERATING ACTIVITIES

Profit after tax

Add/(less) non-cash items:

Share of retained loss of associates and joint ventures

Depreciation and amortisation

Movement in foreign exchange

Decrease in future tax liability

Increase in employee entitlements

Add/(less) items classified as investing activities:

(Gain) on sale of property, plant and equipment

Movements in working capital:

Decrease/(increase) in receivables and prepayments

Decrease/(increase) in inventory

Increase in trade payables and accruals

Decrease/(increase) in taxation payable

Net cash flow from operating activities

14,800	9,848
236	221
15,327	14,499
-	6
(105)	(3,230)
573	1,482
16,031	12,978
(110)	(2,917)
(6,251)	4,250
102	(124)
3,294	920
(987)	1,914
(3,842)	6,960
26,879	26,869

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

21. RELATED PARTY TRANSACTIONS

The Company is a wholly owned entity of the Crown. The government significantly influences the role of the Company in addition to being a major source of revenue.

The Group enters into transactions with government departments, state-owned enterprises and other Crown entities. These transactions occur within a normal customer / supplier relationship on terms and conditions no more or less favourable than those which it is reasonable to expect the Group would have adopted if dealing with that entity at arm's length in the same circumstances. Such transactions have not been disclosed as related party transactions.

Strategic funding amounting to \$43,103,000 was received from MBIE (a government department) during the year to 30 June 2021 (2020: \$43,103,000).

Strategic funding is disclosed on the face of the Statement of Comprehensive Income.

	Revenue earned		Due from	
	2021 \$000	2020 \$000	2021 \$000	2020 \$000
Transactions with:				
Associates	5,867	4,304	1,483	1,142

For the year ended 30 June 2021, the Group has impaired a related party receivable for \$42,000 (2020: \$224,000).

The Group contracted with no parties associated with directors during the year.

Executive remuneration

Plant & Food Research's remuneration policy has four objectives:

- (i) Establish and maintain fair and competitive salaries;
- (ii) Recognise and reward difference in individual ability and performance;
- (iii) Enable positions to be assessed to both internal and external value; and
- (iv) Provide appropriate pay ranges for positions requiring different levels of responsibility, experience, skill and knowledge.

Executive remuneration is set having regard to:

- Prevailing market and economic conditions
- Organisational performance and individual experience and contribution;
- Internal equity and pay parity
- Accurate benchmark position and job size
- Market benchmark survey results

	GROUP	
	2021 \$000	2020 \$000
Salaries and other short term employee benefits of the Chief Executive and other members of the Senior Leadership Team	2,656	3,110

Total executive remuneration detailed above includes other benefits (employer contributions to superannuation and health insurance) totalling \$90,000 (2020: \$98,000).

There were 8 members of the Senior Leadership Team (including the Chief Executive) during the twelve months ending 30 June 2021 (2020: 8).

From 1 July 2019 executive remuneration consists of base salary and employer contributions to superannuation and health insurance. Prior to this there was an at risk component included in executive remuneration. Base salaries were increased in 2020 by \$390,000 to recognise the removal of the at risk component from the total remuneration package. The 2020 total executive remuneration also includes the prior year contractual at risk component paid in the 2020 financial year.

A number of key management personnel provide directorship services to subsidiaries and other entities as part of their employment without receiving any additional remuneration.

The Group purchases directors and officers insurance for the benefit of key management personnel in relation to the services they provide to the Group.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

21. RELATED PARTY TRANSACTIONS (CONTINUED)

Chief Executive remuneration

The Chief Executive's remuneration is approved by the Board on the recommendation of the Appointments & Remuneration Committee on an annual basis.

		Salary	Benefits	At Risk**	Total
The Chief Executive's remuneration for 2020 and 2021 was:					
2021		567,966	-	-	\$567,966
2020		566,182*	-	91,362	\$657,544

* As noted above, the 2020 salary was increased to recognise the removal of the at risk component.

** The at risk payments made represent the prior year contractual bonus owing. The bonus component included company and personal performance objectives designed to motivate and reward performance in the financial year.

22. FINANCIAL INSTRUMENTS

The Group's activities expose it to a variety of financial instrument risks, including market risk, credit risk and liquidity risk. The Group has a series of policies to manage the risks associated with financial instruments and seeks to minimise exposure from financial instruments. These policies do not allow any transactions that are speculative in nature.

Market risk

Currency risk

Currency risk is the risk that the fair value or future cash flows will fluctuate due to changes in foreign exchange rates. The Group purchases goods and services overseas which require it to enter into transactions denominated in foreign currencies. The Group also holds small balances of AUD, EUR and USD at call in order to settle transactions denominated in foreign currencies. As a result of these activities, some limited exposure to currency risk arises.

It is the Group's policy to manage foreign currency risks arising from contractual commitments and liabilities by entering into foreign exchange forward contracts to hedge the foreign currency risk exposure. All of the forward exchange contracts have maturities of less than one year at the balance sheet date.

Sensitivity analysis

The Group's results are not sensitive to changes in foreign exchange rates.

Credit risk

Credit risk is the risk that a third party will default on its obligations to the Group, causing the Group to incur a loss.

Due to the timing of its cash inflows and outflows, the Group invests surplus cash with registered banks with a Standard & Poor's credit rating of A- or above. The Group's investment policy limits the amount of credit exposure to \$10M with any one institution.

The largest credit exposure with any one institution at balance date is \$6.1M (2020: \$1.9M).

The Group's maximum credit exposure for each class of financial instrument is represented by the total carrying amount of cash and short-term deposits (note 8), net receivables (note 9) and derivative financial assets. There is no collateral held as security against these financial instruments.

Management has a credit policy in place under which each new customer is individually analysed for credit worthiness and assigned a credit limit before the standard payment and delivery terms and conditions are offered. Where available the Group reviews external ratings and references are obtained. Credit limits are reviewed on a regular basis.

Net receivables includes two customers who represent 54% (2020: 55%) of the total trade receivables at balance date. The Group is not exposed to any other concentrations of credit risk.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

22. FINANCIAL INSTRUMENTS (CONTINUED)

Liquidity risk

Liquidity risk is the risk that the Group will encounter difficulty raising liquid funds to meet commitments as they fall due. Prudent liquidity risk management implies maintaining sufficient cash, the availability of funding through an adequate amount of committed credit facilities and the ability to close out market positions. The Group aims to maintain flexibility in funding by keeping committed credit lines available. It is the Group's policy to provide credit and liquidity enhancement only to wholly owned subsidiaries.

The table below analyses the Group's derivative financial instruments and other financial liabilities that will be settled on a gross basis into relevant maturity groupings based on the remaining period at the balance sheet date to the contractual maturity date. The amounts disclosed are the contractual undiscounted cash flows.

	Carrying amount	Contractual cash flow	GROUP 2021		
			Up to 12 months	1-2 years	3 years +
Trade and other payables	11,844	11,844	11,844	-	-
Borrowings	-	-	-	-	-
	11,844	11,844	11,844	-	-
Forward exchange contracts					
Inflow	(58)	2,871	2,871	-	-
Outflow	-	-	-	-	-

	Carrying amount	Contractual cash flow	GROUP 2020		
			Up to 12 months	1-2 years	3 years +
Trade and other payables	9,130	9,130	9,130	-	-
Borrowings	4,200	4,200	4,200	-	-
	13,330	13,330	13,330	-	-
Forward exchange contracts					
Inflow	(10)	3,510	3,510	-	-
Outflow	-	-	-	-	-

Fair value estimation

The group uses various methods in estimating the fair value of a financial instrument.

- The fair value is calculated using quoted prices in active markets (Level 1)
- The fair value is estimated using inputs other than quoted prices included in Level 1 that observable for the asset or liability either directly (as prices) or indirectly (derived from prices) (Level 2); and
- The fair value is estimated using inputs for the asset or liability that are not based on observable market data (Level 3).

The Group's derivative financial instruments are all level 2 forward foreign exchange contracts with a fair value of (\$58,000) (2020: (\$10,000)).

These have been fair valued using forward exchange rates that are quoted in an active market.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

23. CATEGORIES OF FINANCIAL ASSETS AND LIABILITIES

The carrying amounts of financial assets and liabilities by classification are as follows:

		GROUP	
	Note	2021 \$000	2020 \$000
<i>Financial assets measured at amortised cost</i>			
Cash and cash equivalents	(8)	9,812	2,888
Trade and other receivables	(9)	40,515	35,199
Total financial assets at amortised cost		50,327	38,087
<i>Financial liabilities measured at amortised cost</i>			
Accounts payable and accruals	(10)	11,844	9,130
Employee entitlements	(11)	12,380	11,917
Borrowings	(8)	-	4,200
Lease liabilities	(13)	909	804
Total financial liabilities at amortised cost		25,133	26,051

The fair value of the financial assets and liabilities approximate their carrying value.

24. CAPITAL MANAGEMENT

The Company's capital is its equity, which comprises share capital and accumulated funds. Equity is represented by net assets.

The Company is subject to the financial management and accountability provisions of the Crown Research Institutes Act 1992, which imposes restrictions in relation to borrowings, acquisition of securities, issuing guarantees and indemnities and the use of derivatives.

The Company manages its equity as a by-product of prudently managing revenues, expenses, assets, liabilities and general financial dealings to ensure the Company effectively achieves its objectives and purpose, whilst remaining a going concern.

The Group's objectives when managing capital are to safeguard the Group's ability to continue as a going concern in order to provide returns for shareholders and benefits for other stakeholders and to maintain an optimal capital structure to reduce the cost of capital. The Group recognises the need to maintain a balance between the higher returns that might be possible with greater gearing and the advantages and security afforded by a sound capital position.

25. CONTINGENCIES

Contingent Liabilities

There were no contingent liabilities known to exist at balance date.

In 2020 the Company had identified issues with the calculation of leave entitlement under the Holidays Act 2003 and had contracted an external consultant to complete an analysis of its payroll system. Preliminary findings of this review had identified some issues in the calculation of certain leave entitlements however these could not be reliably measured at this time. During 2021 additional work has been undertaken and the Company has provisioned for this liability in 2021, refer Note 3 (U).

Contingent Assets

There were no contingent assets known to exist at balance date (2020: \$0).

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2021

26. SUBSEQUENT EVENTS

Kiwifruit Breeding Centre

Plant & Food Research and Zespri are establishing a new 50/50 joint venture The Kiwifruit Breeding Centre Limited, dedicated to breeding new kiwifruit cultivars. This arrangement builds on the success of the current breeding partnership in place between the parties and will allow the relationship to grow while meeting new challenges and opportunities that are emerging as the global kiwifruit market develops.

The shareholding Ministers of Plant & Food Research have approved for 'The Kiwifruit Breeding Centre Limited' to be formally incorporated. 1 October 2021 has been agreed as the date the joint venture will commence operations.

Approximately 45 staff are expected to transition from Plant & Food Research to the Kiwifruit Breeding Centre.

There is not expected to be a material impact on the Group financial statements of Plant & Food Research from the formation of the new joint venture.

COVID-19

At the date of signing the Group Financial Statements, Plant & Food Research operations continue to be impacted by the COVID-19 national lockdown on 18 August 2021. While the length of the current restrictions on activity remain uncertain there is not expected to be any material impact on the carrying value of the assets and liabilities as at 30 June 2021, as reported in the Group Financial Statements.

PERFORMANCE INDICATORS

for the year ended 30 June 2021

	2021 Actual	2020 Actual
RESEARCH COLLABORATION		
<i>Peer reviewed publications</i>	365	339
<i>Book chapters</i>	1	11
TECHNOLOGY & KNOWLEDGE TRANSFER		
Licences - new	15	16
Client reports	474	473
Plant variety rights		
Granted in NZ	6	9
Granted overseas	19	4
Patents	7	22
Trademarks		
Registered	19	14
<i>Requests for information from databases and collections</i>	24	37
SCIENCE QUALITY		
Science reviews	1	2
International awards	3	6
Invitations for international committees	19	20
Invitations for editorial boards	17	29

STATEMENT OF RESPONSIBILITY

for the year ended 30 June 2021

In the financial year ended 30 June 2021, the Board and management of The New Zealand Institute for Plant & Food Research Limited were responsible for:

- the preparation of the financial statements and the judgements used therein.
- establishing and maintaining a system of internal control designed to provide reasonable assurance as to the integrity and reliability of financial and non-financial performance reporting.

In the opinion of the Board and management of The New Zealand Institute for Plant & Food Research Limited, these financial statements fairly reflect the financial position and operations of The New Zealand Institute for Plant & Food Research Limited for the year ended 30 June 2021.



Nicola Shadbolt, Chair
27 August 2021



Wendy Venter, Director
27 August 2021

We are providing opportunities for young researchers, such as summer student Annalise Taylor, to build their science capability and create a better world.



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